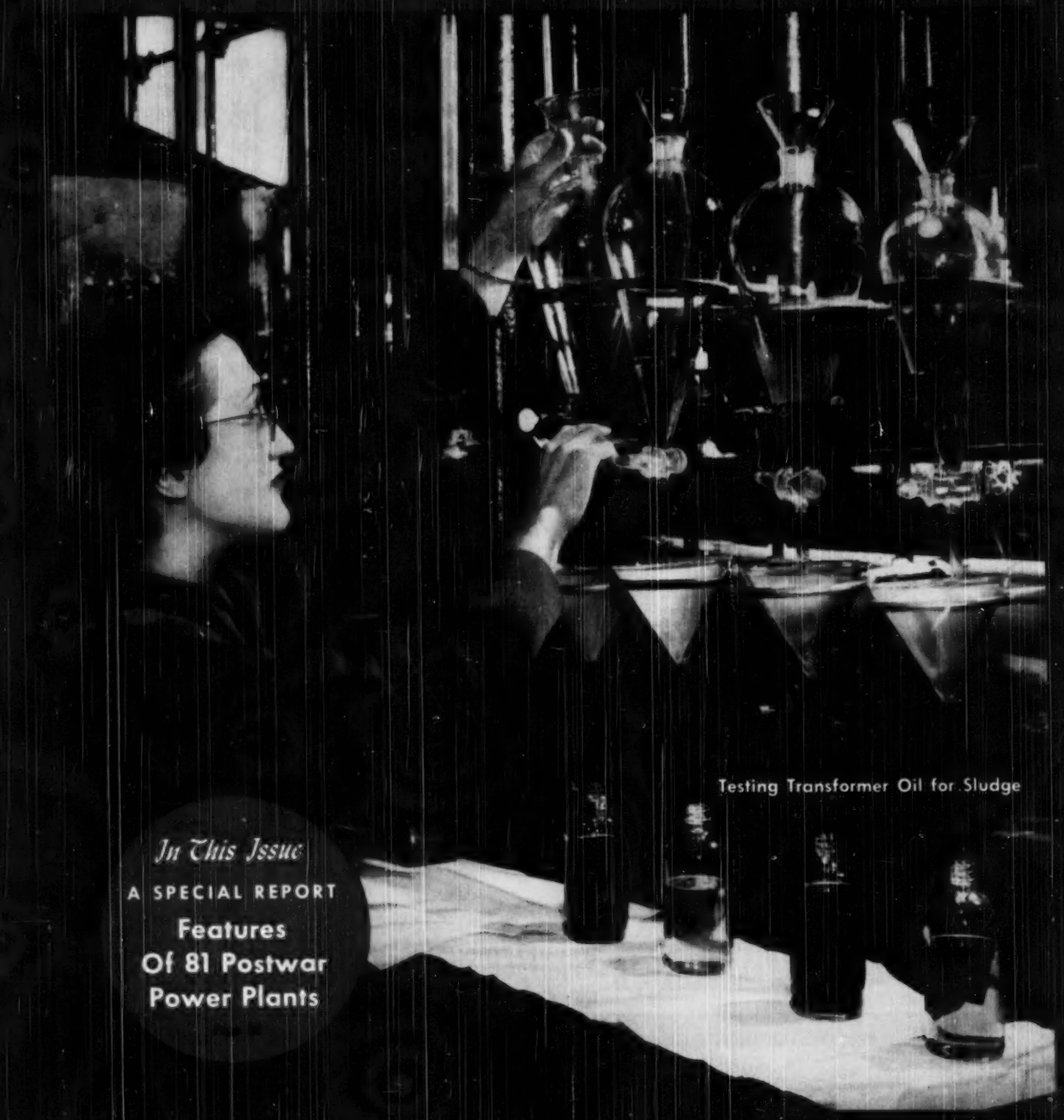
ELECTRICAL WORLD

A McGRAW-HILL PUBLICATION



Testing Transformer Oil for Sludge

In This Issue

A SPECIAL REPORT

Features Of 81 Postwar Power Plants

NEW!

COMPACT! ECONOMICAL!

Murray LOAD CENTERS

with Fully Magnetic Circuit Breakers

that are Interchangeable with Other New Single Pole Individually Housed Breakers

Now you can get all the advantages of *fully magnetic* circuit breaker protection in load centers that are trim and compact — with breakers that are interchangeable with other new single pole individually housed breakers! Now you can get utmost flexibility with minimum stock — make up your own combination right on the job! Now you can forget about "derating" . . . now you can banish the nuisance of false tripping . . . now you can make satisfactory installations of circuit breakers in warm or poorly ventilated locations—where space and cost are important!

These compact new Murray load centers are available in 2, 6 or 8 circuit models. They come equipped with the sensational new *small size* Murray fully magnetic circuit breakers — now 30 per cent smaller than previous fully magnetic circuit breakers — available in ratings of 10 through 50 amp. They save you time . . . save you trouble . . . save you money — yet assure the user positive protection combined with utmost satisfaction!

Shallower Box —

—only 3 inches deep—ideal for flush installation in "dry wall" construction. Plus a simple ⅜" plaster line adjustment!

See for yourself why Murray *fully magnetic* breakers can't trip from heat . . . never need derating . . . always carry rated load plus harmless overloads—even in warm locations and poorly ventilated panels. Clear, simple diagrams tell the story in this folder. Write for your copy today.

Murray MANUFACTURING CORPORATION

1250 ATLANTIC AVENUE • BROOKLYN 16, N. Y.

Electrical Safety Devices for Home and Industry

OF PERSONAL INTEREST

"Blueprinting the Future" is in the next regular issue of Electrical World coming May 22.

The demand for electric energy will surely double or triple in the coming 10 to 15 years. Setting our sights on that demand now is as vital as any problem today.

GROWTH

In 1965 the generating capacity of the U. S. should be about 200 million kw, producing nearly 750 billion kwhr for an energy sale of around 650 billion kwhr, at a revenue of over $10 billion. Today, the capacity is about 63 million kw, the output 291 billion kwhr, the sale 250 million kwhr, and the revenue $4.6 billion. And this represents a somewhat slower growth than during the past 23 years.

TIMELY

Industry leaders have realized for a long time that they must face today the problems that doubled or tripled loads will bring ten or 15 years hence.

Electrical World has mustered the best available brains to help measure these future problems, as you may agree from a quick run-down of the contents:

Except for articles on generation and Federal power development written by Electrical World editors, and an important survey of economic prospects by the McGraw-Hill Department of Economics, the issue is entirely written by men of the industry.

FROM THE FRONT LINE

Who they are and their subjects:

Walker Cisler of Detroit Edison and F. P. Fairchild of Public Service of New Jersey: Generation.

V. M. Marquis of American Gas & Electric: Transmission.

W. J. Lyman of Duquesne Light: Subtransmission.

Frank Sanford of Commonwealth Services: Distribution.

E. N. Strait of Pioneer Service & Engineering Co.: Rates.

P. H. Powers of West Penn Power: Public Relations.

C. B. Cooke, Jr., of Ford, Bacon & Davis: Organization.

What these men have to say is not only worth the thoughtful attention of everyone devoted to the industry, but it is interesting and exciting withal. It's all in "Blueprinting the Future" in Electrical World for May 22.

Cordially,
THE EDITORS.

ELECTRICAL WORLD

Published for 76 years for those engaged in the business of generating, transmitting, distributing or applying electric power

VOL. 133 No. 19 **CONTENTS** **MAY 8, 1950**

Editorials 69

News: The Electrical Week Washington Comment Technical Notes 71

Electric House Heating: What Must Be Done? ..... By F. A. Compton 81
How the responsibility toward this new load can be fulfilled

New Life for Transformer Oils ..... By R. F. Seubert and B. R. Sarchet 84
Tests report how new inhibitor extends life of transformer oils

DISTINCTIVE DESIGN FEATURES OF 81 POSTWAR PLANTS 88
Results of an industry wide survey are interpreted to show what power plant designers are doing to contend with the high costs

ELECTRICAL WORLD'S Steam Station Check Chart 93–104
Over 200 plant design features of 81 postwar power plants presented in check-chart form for quick analysis and interpretation

Departments

How To	106	Manufacturers and Markets	152
Engineering Reference Sheets	116	New Electrical Construction	154
Load Building	131	Books	155
New Equipment	138	Technical Literature	156
News About People	147	Letters	159

Index of Advertisers 162

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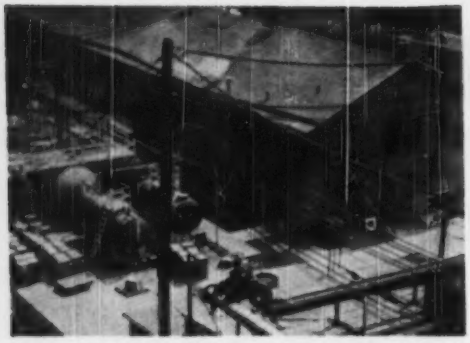
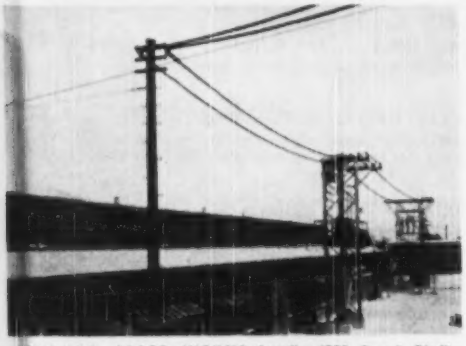


NEW JERSEY CHEMICAL PLANT saves in installation cost and obtains protection against atmosphere containing corrosive acids and chlorine, with Okolite-Okoprene Self-Supporting Cable. Illustration shows a typical 90° turn of the new aerial cable installed on existing structures above conventional type feeder supported by cross arms. Longest transmission line is 2000 ft. In this 4000 ft. Okonite-Okoprene primary distribution system.



ALABAMA GLASS WORKS installs 4000 ft. of Okolite-Okoprene Self-Supporting cable at new plant. Neat, modern appearance of this cable is in keeping with modern efficiency of the plant. Simple line tap, permitted by Okonite Dualay construction, serves the 2300/440 volt steel platform substation. Outdoors on poles or indoors where circuits can be carried overhead supported by beams or trusses, Okolite-Okoprene Self-Supporting Aerial Cable provides a dependable and economical method of industrial power transmission.

WEST COAST LUMBER COMPANY follows the modern trend at its new pulp mill — with Okolite-Okoprene Self-Supporting cable. Note the clean appearance of this cable compared with the congestion of the open wiring shown in the inset photo. Space-saving economy, freedom from maintenance and long, trouble-free service throughout the system are advantages provided by this unique Okonite overhead transmission line.

HERE-THERE-EVERYWHERE

OKOLITE-OKOPRENE SELF-SUPPORTING AERIAL CABLE

SAVES | *SPACE* *INSTALLATION COSTS* *MAINTENANCE COSTS*

Industrial plants everywhere are finding important economies, increased efficiency and better plant appearance by installing Okolite-Okoprene Self-Supporting Aerial Cable. Light weight and great strength mean longer spans — with fewer poles and fittings. Insulated cable reduces congestion of open wiring, eliminates clearance problem near buildings. Okolite insulation and Okoprene sheathing combine to give greater dependability — especially during emergency periods of prolonged wet weather, ice and high wind. Exclusive Dualay* construction (the lay of the twisted insulated conductors is reversed at short intervals) offers additional savings because quick, simple line taps can be taken off at any point, even in mid-span, without disturbing the other conductors or messenger and without using racks or spreaders.

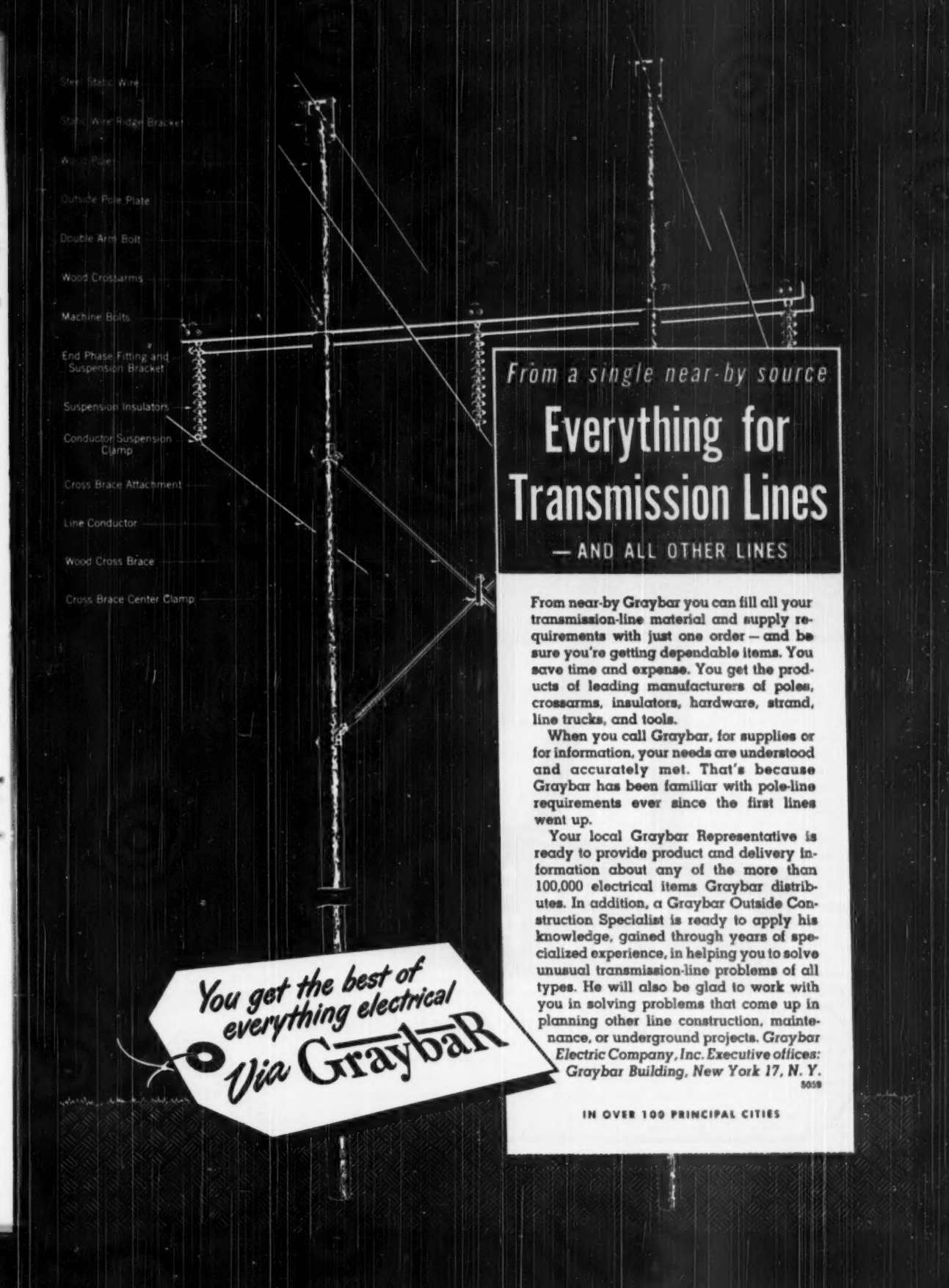
Write for the informative, 52-page manual on Okolite-Okoprene Self-Supporting Aerial Cable. The Okonite Company, Passaic, N. J.

*Reg. U.S. Pat. Off.

THE BEST CABLE IS YOUR BEST POLICY

OKONITE SINCE 1878 *insulated wires and cables*

B126



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— AND ALL OTHER LINES

From near-by Graybar you can fill all your transmission-line material and supply requirements with just one order — and be sure you're getting dependable items. You save time and expense. You get the products of leading manufacturers of poles, crossarms, insulators, hardware, strand, line trucks, and tools.

When you call Graybar, for supplies or for information, your needs are understood and accurately met. That's because Graybar has been familiar with pole-line requirements ever since the first lines went up.

Your local Graybar Representative is ready to provide product and delivery information about any of the more than 100,000 electrical items Graybar distributes. In addition, a Graybar Outside Construction Specialist is ready to apply his knowledge, gained through years of specialized experience, in helping you to solve unusual transmission-line problems of all types. He will also be glad to work with you in solving problems that come up in planning other line construction, maintenance, or underground projects. *Graybar Electric Company, Inc. Executive offices: Graybar Building, New York 17, N. Y.*

5059

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MECHANICALLY TRIP-FREE PNEUMATIC OPERATOR *assures positive tripping*

***UNITOP* FRAME CONSTRUCTION** *eliminates dirt-and-moisture-collecting crevices*

SINGLE-BREAK *RUPTOR* INTERRUPTING DEVICE *for low arc energy release*

HERE'S HOW the Allis-Chalmers pneumatic operator with mechanically trip-free design assures instant tripping under any conditions. *On a fault, the operator is mechanically unlatched from the tripping mechanism.* By isolating tripping and closing mechanisms in this way, the tripping force doesn't have to work against valves or back pressures of any kind. This positive tripping action is a standard feature on all FZO-150 breakers.

COMPLETE WEATHER PROTECTION

One-piece, continuous heavy steel *Unitop* construction eliminates crevices that collect dirt and moisture. All three poles, under one top, are completely protected against severe weather conditions. Wiring is carried in sealed ducts within the top frame.

FAST, EFFICIENT INTERRUPTION

Arcs are quickly extinguished with simple, single-break *Ruptor* interrupting device. No unnecessary moving parts to bind or fail. Self-wiping, self-aligning contacts prevent formation of high resistance oxides, have low temperature rise.

Every FZO-150 breaker is factory assembled and tested, then shipped without dismantling so that test performance will be met in the field.

For details on the FZO-150 (bulletin 71B6421A) or other breakers to meet any utility need, contact your nearby A-C sales office. A-3072

ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.

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STANDARD RATINGS
8 cycle interruption

Rated KV	Max. Design KV	Rated Amps. (60 cycle)	Kva. Interr. Cap.
14.4	15.5	1200	1,000,000
14.4	15.5	2000	1,500,000
23.0	25.8	1200	500,000
34.5	38.0	600	500,000
34.5	38.0	1200	1,000,000
34.5	38.0	1200	1,500,000
34.5	38.0	2000	2,500,000
46.0	48.3	600	500,000
46.0	48.3	1200	1,500,000

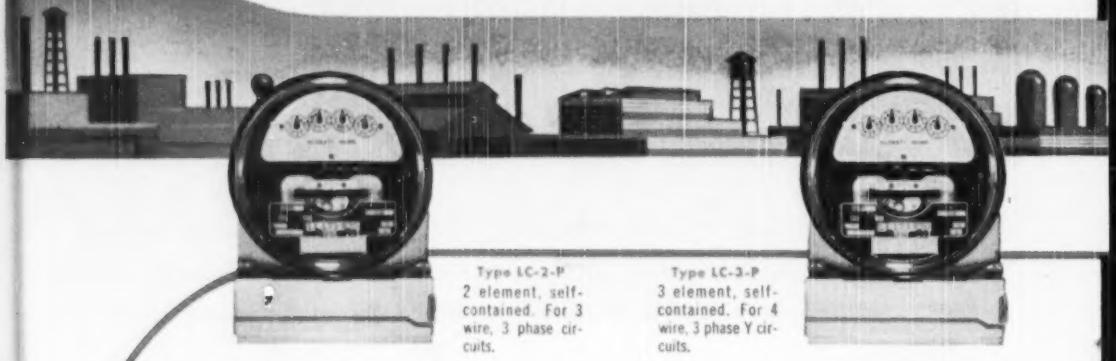
ALLIS-CHALMERS

ALL ADVANTAGES OF SINGLE DISK

AND SMALL SIZE ARE YOURS IN

BOTH 2-ELEMENT AND 3-ELEMENT

Sangamo Polyphase Meters



Type LC-2-P
2 element, self-contained. For 3 wire, 3 phase circuits.

Type LC-3-P
3 element, self-contained. For 4 wire, 3 phase Y circuits.

Only a minimum of space is necessary for mounting either 2-element or 3-element Sangamo polyphase watthour meters for power metering on all commercial and industrial applications.

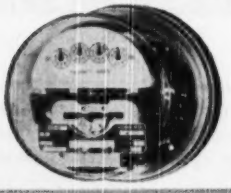
The complete Sangamo Type LC polyphase line, whether 2, 2½ or 3 element meters, have *single disk* construction which permits their manufacture in the *smaller* sizes required of modern meters for standard "A" "S" or "P" mountings.

Mechanical stability—electrical characteristics—full temperature and overload compensations—resulting from the modern design features of Type LC meters, assure dependable service and high accuracy of measurement over the entire load range up to 400% of meter rating.

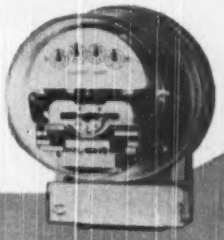
SANGAMO

DESIGN FEATURES

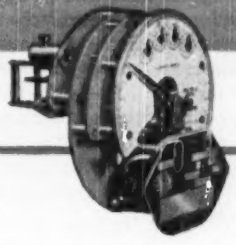
- ★ Driving element, moving system and register all mounted on one die-cast supporting grid, assuring permanent mechanical relation of all component parts.
- ★ Damping magnets of alnico are highly resistant to the demagnetizing effect of lightning surges and stray fields.
- ★ Service-proved oilless bearing system.
- ★ A basic constant of 0.6 watthours per disk revolution for each element, producing excellent inherent overload and voltage characteristics.
- ★ Generous design of copper in current coils provides high thermal capacity on overloads.
- ★ High insulation levels of potential and current elements. Also terminal insulation highly resistant to arc tracking.
- ★ Micrometer adjustments for full load, light load, power factor and element balance.
- ★ Easy accessibility of all parts for inspection and adjustment or replacement.



Type LC-2-S
2 element, self-contained Polyphase Watthour Meter.



Type LC-3-A
3 element, self-contained Polyphase Watthour Meter.



For convenient, dependable demand measurement on all polyphase circuits ask for Bulletin 321, which describes Type LCH demand registers for use on Type LC meters. These registers are timed by the new Sangamo low-speed, high torque, hysteresis type motor, lubricated with a silicone of constant viscosity over wide temperature ranges. Years of troublefree operation are assured without expensive maintenance.

Write for Bulletin 240 for detailed information on LC Meters.

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Protect the plant and
with CROUSE-HINDS
. . . . . bells, horns, sirens, and visual signals

Raintight signals for non-hazardous locations

The most complete line

Type MH Raintight Horn with Grill

Type MH Raintight Horn with Single Projector

Type MH Raintight Horn with Double Projector

Type PS Raintight Pilot Light Condulet

Continuous production is of vital importance in successful plant operation. Costly shutdowns can often be avoided by Crouse-Hinds signals that give an instant warning of abnormal operating conditions or sound an alarm in case of fire.

A wide variety of signals is necessary to meet the varied conditions in industry. Crouse-Hinds offers a comprehensive line of signaling devices for plant protection and communication . . . . . sirens, horn, bells, and visual signals. Each unit is designed with individual characteristics that make it superior for a particular kind of service. There are Crouse-Hinds signals for use in non-hazardous locations; raintight signals for use where exposed to the weather; explosion-proof and dust-tight signals for use in hazardous locations; signals with a low volume of sound and high power signals that are extremely loud.

You have a definite advantage in selecting signals from the all-inclusive Crouse-Hinds line. It is possible for you to meet the requirements of every location. In noisy areas the character of the noise is of first importance. A signal producing a sound having the greatest contrast to the area noise should always be selected. For example, a horn would not be suitable in

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CONDULET
First in the field
STANDARD OF QUALITY

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

maintain continuous production

Signaling Devices

for control of operations, and fire protection.

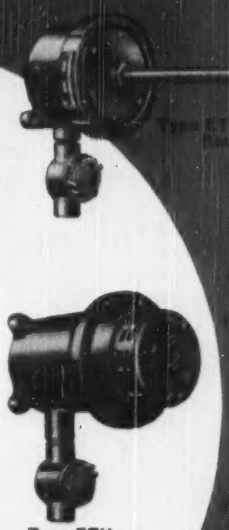
of explosion-proof and dust-tight signals for hazardous locations

surroundings where a constant hum or whine is present but a bell could readily be heard. A bell would be inadequate in surroundings where the noise is produced by hammering on metal but a horn would give the required contrast.

Careful consideration should also be given to the number of signals required. In general, much better coverage is obtained by even distribution of several low output units than by one or two high output units. On the other hand, a high powered unit is necessary when the sound must be projected a considerable distance from one location.

Crouse-Hinds' line of visual signals includes a variety of pilot lights and also the Visularm, a compact unit used to supervise manufacturing processes. The Visularm will automatically indicate normal and abnormal temperature, liquid level, speed, load, or any other condition which can be electrically coupled to the circuit. An independent circuit is provided in the Visularm to actuate an audible signal.

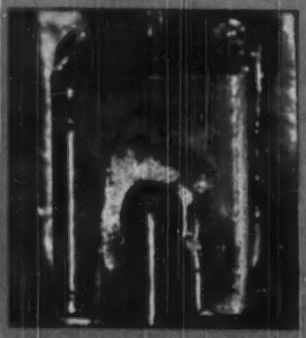
In Crouse-Hinds' complete line there are dozens of different units from which to choose the items to meet your particular requirements. They are all listed in the Crouse-Hinds Condulet Catalog.



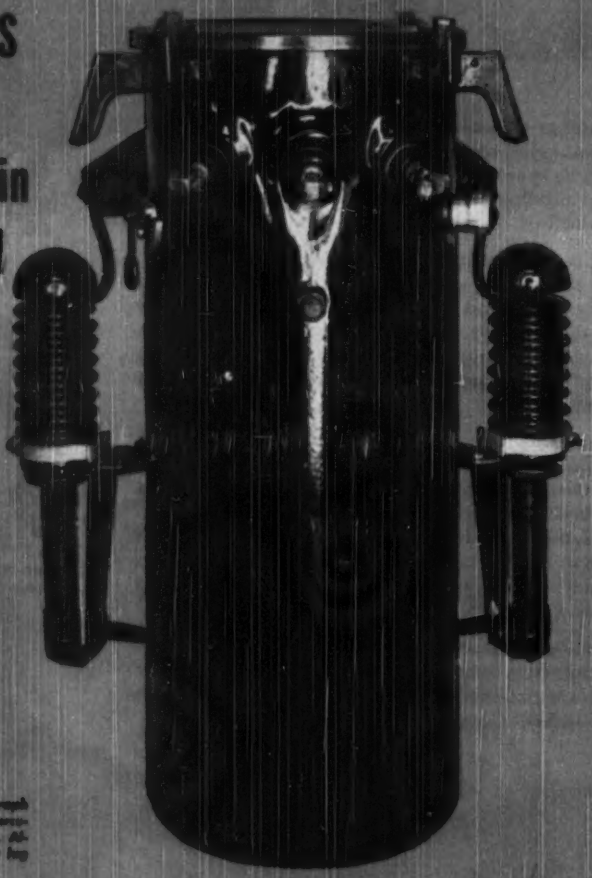
Type ETH
Explosion-Proof
Siren

Now! PORCELAIN ENAMEL TRANSFORMER TANKS

AFTER 10 YEARS IN SERVICE KUHLMAN porcelain enamel tanks still show no wear



The above unretouched photograph demonstrates the fusion of the porcelain enamel to the metal surfaces. Although worn slightly, this support lug shows positively no signs of rust.



This unretouched photograph of a Kuhlman Transformer shows porcelain enamel surfaces good as new after 10 years of exposure to corrosive atmosphere in an industrial area. Tank surfaces show no signs of rusting, cracking or chalking . . . positive proof of the extraordinary durability of porcelain enamel.

GIVES KUHLMAN *life-time* FINISH!

At last . . . a transformer tank finish good for a lifetime! The Kuhlman Electric Company, pioneer of such famous firsts as the Bent Iron Core, the series multiple transformer and clamp type bushing terminals again makes available another of its great achievements . . . porcelain enameled transformer tanks!

Kuhlman pioneered this field before the war, when a large percentage of its production was with porcelain enamel finish. Now . . . backed with the latest economical processing methods and developments in the porcelain enameling industry, Kuhlman once more offers this sensational exclusive feature!

Available on all Kuhlman transformers 10 to 25 KVA, 15,000 volts and below, porcelain enamel *eliminates all future need for tank refinishing.* Gone forever are maintenance costs caused by the continual renewing of old-style paint finishes. Five, ten, twenty years after the transformer is installed on the pole . . . *for its entire lifetime* . . . the porcelain finish remains intact . . . just as good as the day it was first applied!

This photomicrograph actually shows the bond between the metal and the enamel coating, which is responsible for the non-corrosive properties of porcelain enameled tanks. Enamel and metal are dovetailed together, forming a layer firmly attached to sub-metal base.

The transformer on the opposite page is graphic proof of these statements. Added to it are the results of tests in which porcelain enameled metal panels were subjected to years of weathering under the most severe conditions . . . results that prove conclusively porcelain enamel outlasts any other similar type of surface. This is because, unlike paint, which merely covers the surface, porcelain enamel becomes *actually fused to the metal* itself by a chemical bond.

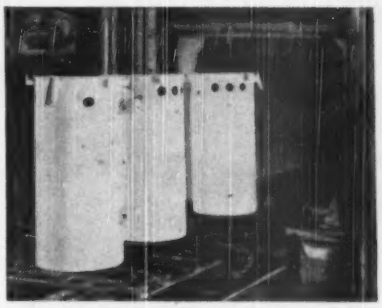
This is due to an oxidation of the metal surface which occurs in the firing ovens, so that as the glass melts, the oxidized surface of the metal is partially taken into solution by the thin layer of glass with which it is in contact. This forms an interfacial layer of glass rich in iron oxide, and in the roughening of the metal surface this layer is firmly attached to the sub-metal base. Result: a rock-hard finish that can't rust, stain, discolor or fade! Even if tank finish is chipped by severe usage, enamel surface will not rust or corrode.

In your terms, this means goodbye to repainting worries and expense . . . *better performance at lower cost!*

And porcelain enameling means much more! The high rate of emissivity of porcelain enamel maintains the heat radiating properties of Kuhlman Transformer tanks, providing cooler operation and longer transformer life. You get, too, a transformer which retains its original attractive finish for its lifetime . . . a particularly important feature in residential areas.

In short, it's the perfect transformer tank finish . . . longer wearing, requiring less maintenance, corrosion resistant, more efficient, handsome.

Kuhlman Transformers with porcelain enameled tanks are available *now,* so call or write the Kuhlman representative in your area today for complete details!



Kuhlman porcelain enameled tanks on their way into bake ovens where heat of 1500° F. permanently fuses the porcelain with the metal. Tanks require no further processing after baking, which transforms raw porcelain frit shown in photograph into permanent, handsome, lifetime finish.

Kuhlman

EXPERIENCE COUNTS—THIS IS OUR 56TH YEAR

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN

EXPORT REPRESENTATIVE *International Standard Electric Corporation,* 67 Broad Street, New York 4, N. Y. Cable Address, Microphone, N. Y

HERE'S YOUR ANSWER

to the problem of HIGH INSULATION PERFORMANCE at LOW cost:

IRVINGTON
Style OW
VARNISHED
FIBERGLAS*

Look to Irvington for the right combination to boost performance, improve quality, cut cost . . . of *your* products! Latest in Irvington's line of leadership is Style OW Varnished Fiberglas Class B insulation, which has *proved* its value in core wrappings, field coils, punchings, similar tough spots.

Irvington Style OW Varnished Fiberglas utilizes a new weaving principle that permits the glass fabric to carry more insulating varnish. Black or yellow, 36″ wide, .007″ to .012″ thick, 25 or 50 yds. long, this new insulation may provide the answer to your design problem. Write today for test reports, further details, samples.

Look to Irvington
for Insulation Leadership

*T.M. Reg. Owens-Corning Fiberglas Corp.

IRVINGTON
VARNISH and INSULATOR COMPANY
Irvington 11, New Jersey

SOLVED— "LIKE MAGIC!" with R&IE

SUBSTATION KNOW-HOW

Special structure arrangements such as shown here are everyday problems with R&IE designers. For over thirty years R&IE has set the pace in solving the simple or complex substation structure requirements.

R&IE Unified Responsibility means that your job is easier to order, to check, to change if necessary. "Under one Roof" R&IE controls all fabrication, equipment assembly and shipping — which means that your station is coordinated and meets your requirements.

BUS DIAGRAM

Very often a transformer and bus rack must be placed at a location which requires a special design of structure. Note here that the incoming line and air-switch tower is used as a support for the elevated bus rack which must clear a traffic aisle and part of the building. The transformer bus had to be located on the other side of the incoming line tower. This is one of the many custom-built sub-station jobs which are "SOLVED —like MAGIC" by R&IE Engineers.

The Check List

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES (INDOOR AND OUTDOOR)
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES
- RK INTERLOCK SYSTEMS
- AUTOMATIC SWITCHING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

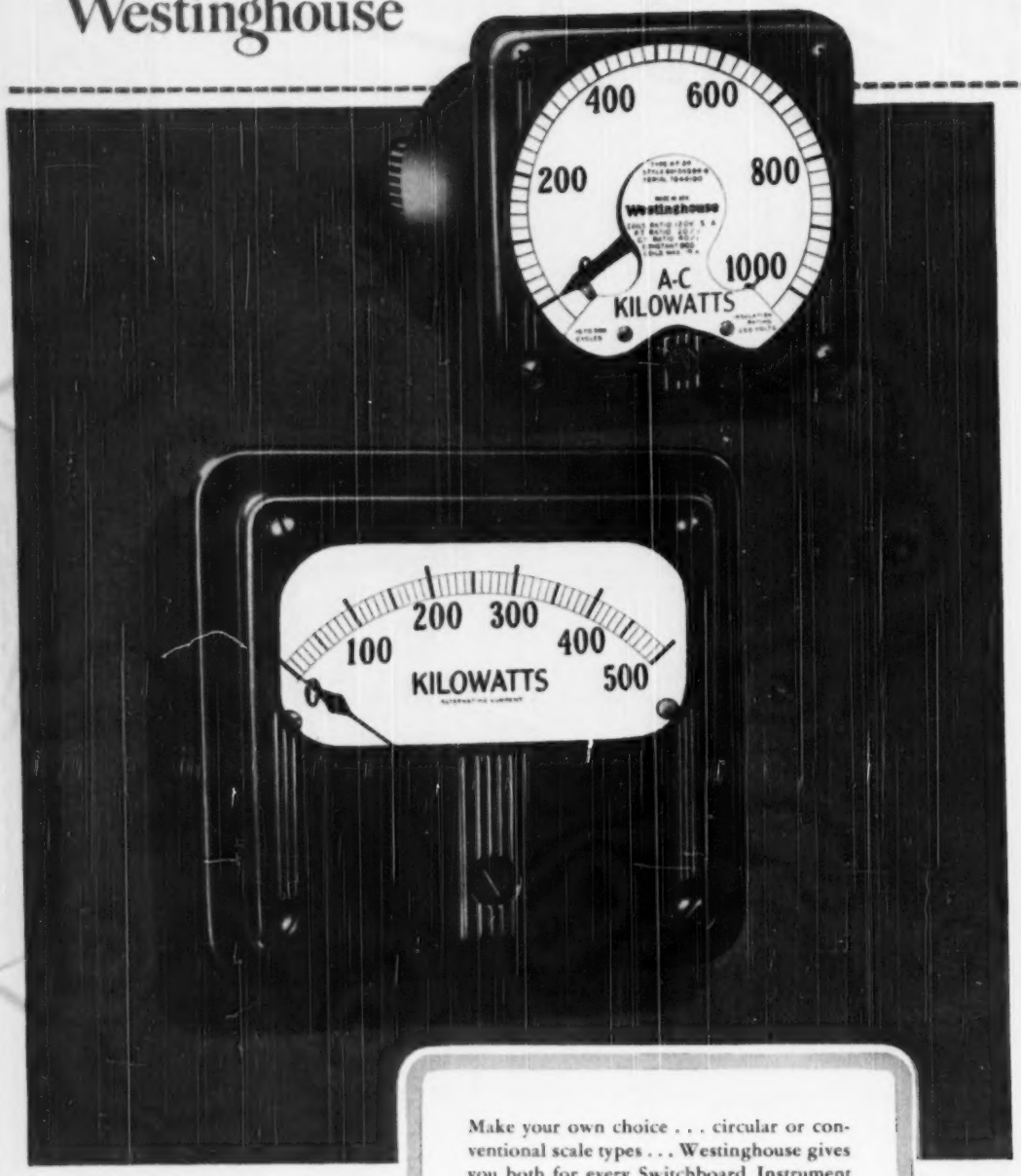
RAILWAY and INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.

AFFILIATED WITH THE I-T-E CIRCUIT BREAKER CO., PHILADELPHIA, PA.
IN CANADA — EASTERN POWER DEVICES LIMITED, TORONTO

FROM THE LAYOUT TO THE LINE — R&IE SUBSTATION SERVICE IS CONTROLLED AT ONE SOURCE

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



Make your own choice . . . circular or conventional scale types . . . Westinghouse gives you both for every Switchboard Instrument application. For all your Switchboard Instrument requirements refer to Westinghouse Catalog Section 43-200—ask your nearest Westinghouse Representative.

One customer cut instrument inventory $70,000!

★ **Shipments in 10 days!** Prompt deliveries eliminate major stocking problems. Westinghouse can meet practically every requirement for switchboard instruments within 10 days of receipt of order at the factory.

★ **The most complete line** in the industry . . . for every switchboard and panel requirement . . . available from one source. A-c and d-c current and voltage; single and polyphase; watts and vars; frequency; power factor; synchroscopes; temperature indicators; ground detectors; synchrotie (position indicators).

★ **Meets A.S.A. standards**—Every Westinghouse Switchboard Instrument is built to the rigid specifications of the "American Standards Association".

. . . it takes *all three* to eliminate costly stocks and storage overhead . . . release working capital . . . still meet your own delivery commitments . . . with *assured* high quality!

Westinghouse instrument specialists have nationwide experience in solving instrument application problems of all types . . . are ready to help you answer *your* special problems. Phone, write or wire your nearest Westinghouse representative. For complete information on all switchboard instruments, ask for C. S. 43-200. Westinghouse Electric Corporation, 95 Orange Street, Newark, N. J. J-40391

Specify Westinghouse *- get more for your instrument dollar!*

Westinghouse INSTRUMENTS

When you think of Electric Heat

think of Hoskins Chromel*

Honestly now . . . who'd have thought, a few years back, that electric heat would ever obsolete the old-fashioned clothes-line rope? And do a better job of drying clothes to boot . . . come fair weather or foul. Faster, easier, cleaner drying. Much more convenient . . . a whole lot more dependable. So what if it does cost more!

Yes, there's a good measure of "magic" in the quick acceptance won by new time-saving, work-saving electrical heating devices . . . whether they're for the home or for commercial or industrial use. An acceptance that comes from an unquestioning faith in their long-life dependable operating performance. And if you look around for the basic element directly responsible for this load-building buyer confidence,' you'll find it in HOSKINS CHROMEL resistance alloy.

For CHROMEL, you know, is the *original* nickel-chromium alloy that *first* made electrical heating practical . . . It's highly resistant to oxidation. Possesses close-to-constant "hot" resistance between 700° and 2000°F. Delivers full-rated power throughout its long and useful life. And its consistent quality and fine durability are the combined results of over 40 years specialized research, manufacturing, and application experience devoted exclusively to . . . more and better use of dependable electric heat.

Our Catalog M-1 contains helpful information for your Load Building Department . . . want a copy?

HOSKINS MANUFACTURING COMPANY

4445 LAWTON AVE. • DETROIT 8, MICHIGAN

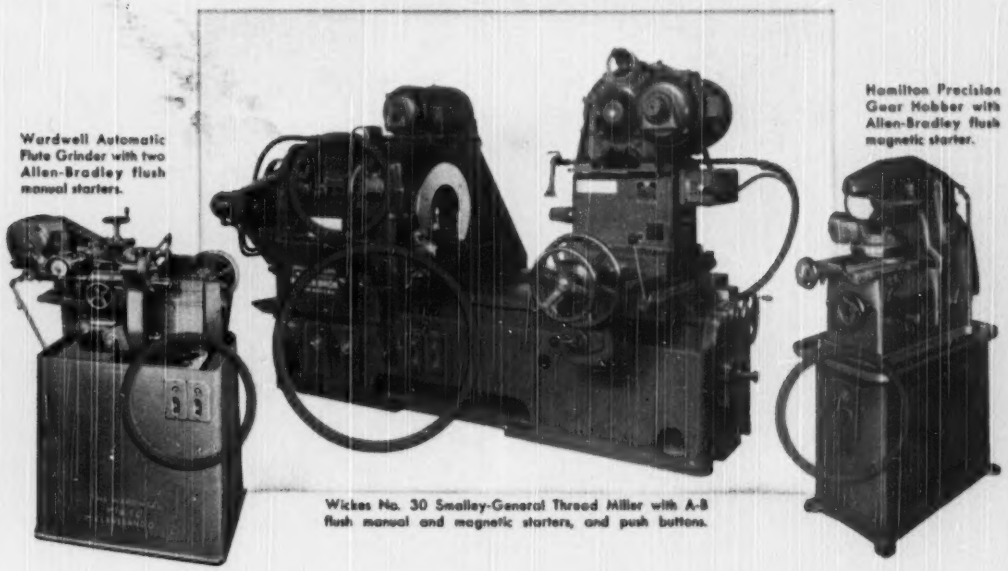
NEW YORK • CLEVELAND • CHICAGO

West Coast Representatives in Seattle, San Francisco, Los Angeles
In Canada: Walker Metal Products, Ltd., Walkerville, Ontario

the [illegible] nickel-chromium resistance alloy that first made electrical heating practical

Build In Your Motor Controls

and improve the appearance of your machines



Wardwell Automatic Flute Grinder with two Allen-Bradley flush manual starters.

Hamilton Precision Gear Hobber with Allen-Bradley flush magnetic starter.

Wickes No. 30 Smalley-General Thread Miller with A-B flush manual and magnetic starters, and push buttons.

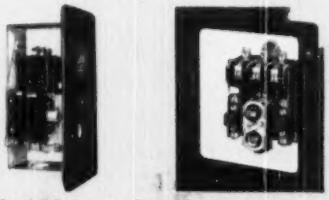
Modern styling calls for flush mounted starters that fit into machine bases. Above are a few examples of machine tools designed for "built-in" controls with flush covers.

Notice the smooth appearance of the machine bases. There are no control boxes to break the streamlined design . . . no exposed conduits to clutter the installation.

Allen-Bradley flush mounted starters are available for manual or automatic operation in various standard ratings and constructions. We shall be glad to send descriptive bulletins.

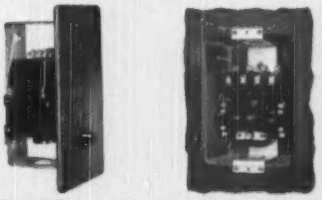
Allen-Bradley Company, 1316 S. Second St., Milwaukee 4, Wis.

BULLETIN 609 MANUAL STARTER



At left—A-B flush mounted manual starter in open type construction for enclosed recesses. At right—A-B manual starter in flush mounted cabinet for installation in open recesses.

BULLETIN 709 MAGNETIC STARTER



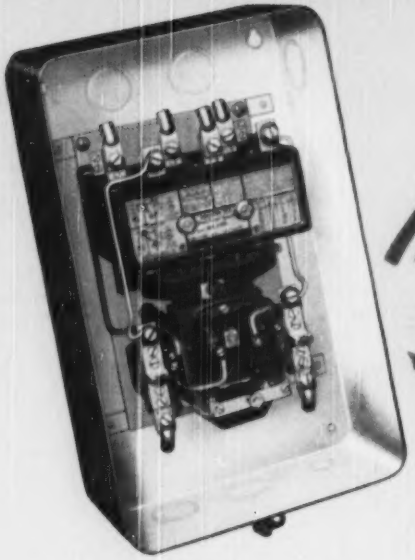
At left—A-B flush mounted automatic starter in open type construction for enclosed recesses. At right—Form 1 A-B unit installed in enclosed machine recess, with cover off.

A-B Quality

ALLEN-BRADLEY

QUALITY

The Motor Starter for THOUSANDS of APPLICATIONS



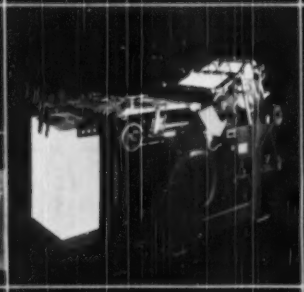
. . . Good for Millions of Trouble-Free Operations

VERSATILE . . . that one word best describes the wide utility of the Allen-Bradley Bulletin 709 Solenoid Starter. Most motor installations need across-the-line starting . . . push-button control . . . and dependable overload protection. These features . . . and many more . . . are provided by all Bulletin 709 Solenoid Starters.

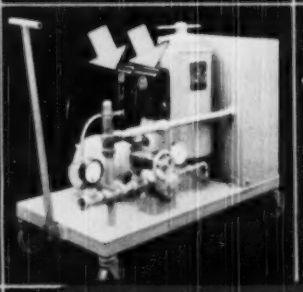
TROUBLE-FREE . . . that one word sums up the year-after-year service of Bulletin 709 Solenoid Starters. Only one moving part . . . hence no tricky gadgets to corrode, stick, or break. No contact maintenance. Install the Bulletin 709 Starter and forget it. It's good for millions of trouble-free operations.

for MOBILE MOTORS

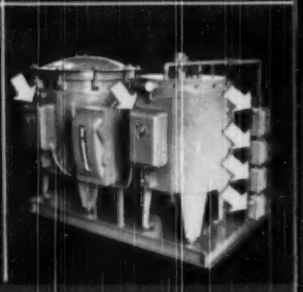
for PRINTING MACHINERY



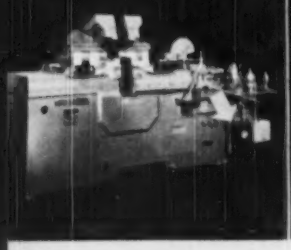
for PAINT SPRAYERS



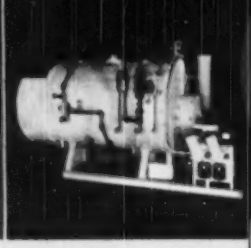
for OIL CONDITIONERS



for FLASH WELDERS



for STEAM GENERATORS



ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

A-B Quality

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wisconsin

THE
CONVENIENCE
OF

Uptegraff DRY TYPE Transformers

Saves money and Time for You!

Because Uptegraff Dry Type Transformers are safe to install anywhere and are light in weight, they do not require special rooms, enclosures, heavy foundations or floor supports. Initial cost is low, installation is relatively simple. Long, expensive bus runs are avoided because they can be located at or near the load center.

Uptegraff Dry Type Transformers are dependable and economical in service. The range of sizes includes transformers up to 2000 KVA, 3 phase, 15,000 volts.

The Uptegraff Unit Substation

R. E. UPTEGRAFF
MANUFACTURING CO.
Scottdale, Pennsylvania

DIRECT CURRENT

NOW YOU CAN GET MORE FOR YOUR LOW VOLTAGE CONVERSION DOLLAR

with the I-T-E Mechanical Rectifier

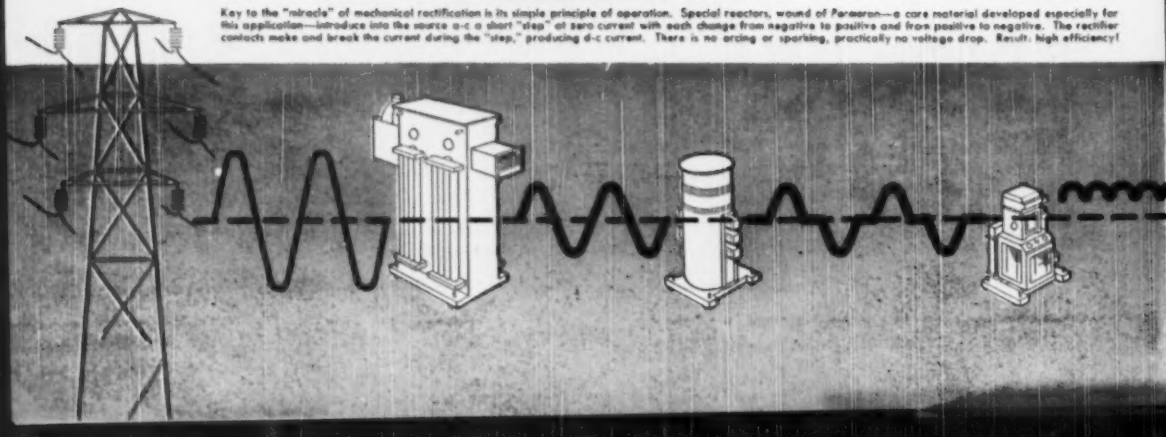
for applications up to 10,000 Amperes per unit at 50 to 400 Volts

With the I-T-E Mechanical Rectifier you get direct current at lower cost. Its higher efficiency and lower costs for installation, operation and maintenance save you money all along the line. Now you can plan your cell layout the way *you* want it—and get all the other advantages of low voltage conversion—without having to resort to high voltages to obtain high efficiency!

YOU GET THESE ADVANTAGES WITH THE MECHANICAL RECTIFIER:

- HIGH EFFICIENCY. —*actually* 96%—*or more—in the 100- to 400-volt* range, because silver-to-silver contact operation minimizes voltage drop in rectifying element.
- SMALL SIZE. Typical plant layout shows space savings up to 50%. Consider what this would mean to you in savings in floor space and building costs!
- EASE OF INSTALLATION. Unit assembly at factory allows "packaged" delivery, easy installation. No special structural foundations are required; no crane service required in rectifier room.
- LOW-COST COOLING. Cooling system is self-contained—no costly external water cooling system used.
- SIMPLE MAINTENANCE. Maintenance is almost entirely mechanical. You need no trained personnel, no complicated tools or instruments for servicing.
- SIMPLE OPERATION. No elaborate starting sequence must be followed. Unit is always ready for operation.
- SAFETY. Use of low voltage instead of high voltage increases safety of your operating personnel and equipment.

Key to the "miracle" of mechanical rectification is its simple principle of operation. Special reactors, wound of *Permaron*—a core material developed especially for this application—introduce into the source a-c a short "step" at zero current with each change from negative to positive and from positive to negative. The rectifier contacts make and break the current during the "step," producing d-c current. There is no arcing or sparking, practically no voltage drop. Result: high efficiency!



USERS—

HERE'S PROOF!

At the Buffalo Electro-Chemical Company, Buffalo, N. Y., two I-T-E Mechanical Rectifier units, both rated at 3500 amperes, 260 volts d-c, and in operation more than a year, have given 96.6% efficiency!

Control cubicle for rectifier and protective equipment.

Mechanical rectifier and saturable reactor. Note small size and compactness of this installation.

Twin rectifier units (right) and control cubicle (left). Note clean appearance and absence of complicated external auxiliaries.

Get the complete story: You'll find complete technical information, including a detailed presentation of operating principles, in I-T-E's Bulletin 4809. Send for it today. The I-T-E representative in your locality will be glad to advise you on adapting the Mechanical Rectifier to your specific needs. Consult him without obligation.

I-T-E

MECHANICAL RECTIFIERS

I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pa.

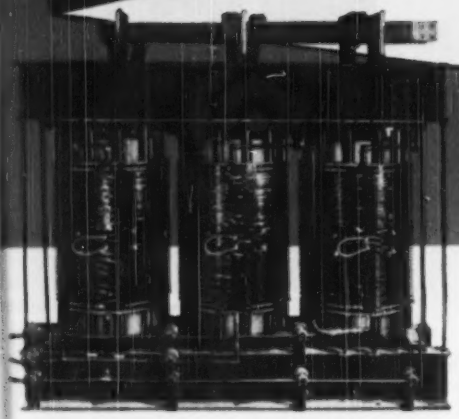
Power Switching Equipment: Relays and Industrial Engineering Div., Emeryville, Pa.

Canadian Mfg. & Sales: Canadian Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., New York

MECHANICAL RECTIFIERS • SWITCHGEAR • UNIT SUBSTATIONS • ISOLATED PHASE BUS STRUCTURES • CIRCUIT BREAKERS • RELAYS • SPECIAL PRODUCTS

DRY-TYPE TRANSFORMERS REQUIRE EXCEPTIONAL INSULATION

Sorgel USES NATVAR FIBERGLAS*



Core and coil assembly of a Sorgel 1500 kva., 3 phase, 12,500 volt air-cooled transformer ready for mounting in the steel enclosure of a unit sub-station. Coils are disc type, separated and supported by steatite spacers. It is built to operate at temperatures up to 80°C. above normal ambient. Natvar Varnished Fiberglas and Varnished Fiberglas Sleeving are used to insulate coils and leads. Natvar Varnished Fiberglas Tape is used for extra end turn insulation.

Air-Cooled, Dry-Type Transformers are built by Sorgel Electric Company, Milwaukee, to meet the increasing demand for large distribution transformers that can be installed *inside* buildings as unit sub-stations without construction of fireproof vaults.

Transformers are housed in compact steel enclosures together with the necessary switches, meters and circuit breakers. They take up very little space, and can be placed at load centers, eliminating long secondary feeders and improving plant layout.

Natvar Varnished Fiberglas, Varnished Fiberglas Tapes and Varnished Fiberglas Sleeving are Class B insulation, approved for 85°C. temperature rise. All Natvar flexible insulations are consistently uniform, no matter when or where purchased. They are immediately available either from your wholesalers' stocks or direct from our own.

Natvar Products

- Varnished cambric—straight cut and bias
- Varnished cable tape
- Varnished canvas
- Varnished duck
- Varnished silk
- Varnished special rayon
- Varnished Fiberglas cloth
- Silicone coated Fiberglas
- Varnished papers
- Slot insulation
- Varnished tubings and sleevings
- Varnished identification markers
- Lacquered tubings and sleevings
- Extruded vinyl tubing and tape
- Extruded vinyl identification markers

Ask for Catalog No. 21

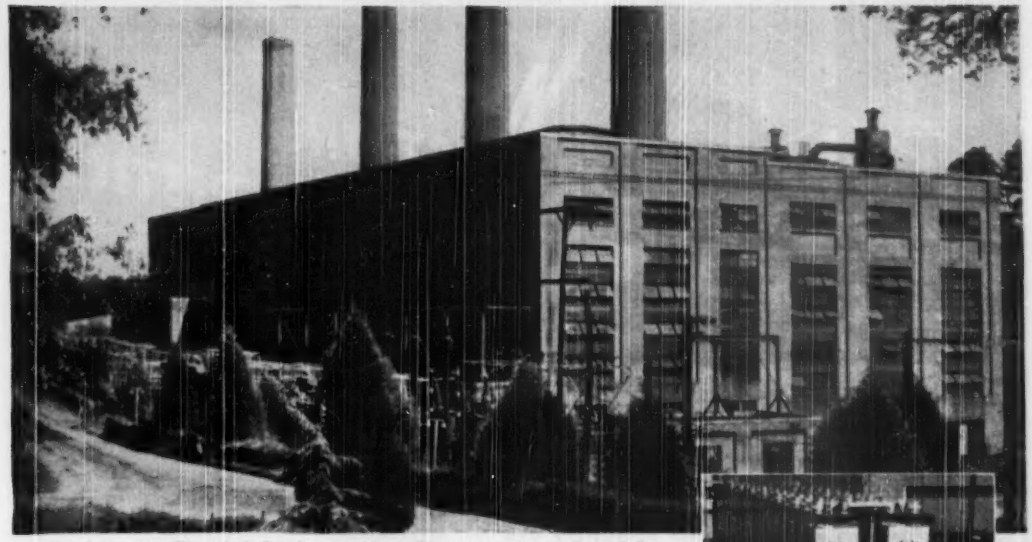
*FIBERGLAS is the trade-mark (Reg. U.S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

THE NATIONAL VARNISHED PRODUCTS Corporation

TELEPHONE RAHWAY 7-8800

CABLE ADDRESS NATVAR: RAHWAY, N. J.

221 RANDOLPH AVENUE ★ WOODBRIDGE, NEW JERSEY



South Carolina Electric & Gas Company's modern steam plant at Parr, S.C.

At this modern station...

Exide-Manchex Batteries

At the Parr, S. C. plant of the South Carolina Electric & Gas Company, positive switchgear operation is assured by the use of Exide-Manchex Batteries. They are used to operate the 132,000-volt, 600-ampere circuit breakers and to take on an intermittent load of 25 to 40 amperes required for slag removal equipment.

You can always count on Exide-Manchex for proved dependability, long life and low cost maintenance. Important among its many features are:

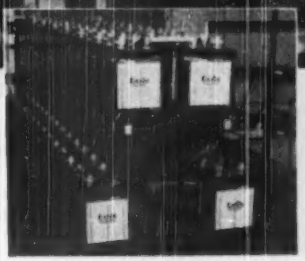
- the famous manchester positive plate with its *exclusive* lead button construction.
- slotted plastic separators, impervious to chemical and electrical reaction.
- plastic spacers that maintain plate alignment.
- the latest development in molded glass jars.
- heavy terminal posts with copper inserts for extra conductivity.

Use the Exide-Manchex for all your stationary battery applications in central and sub-station service.

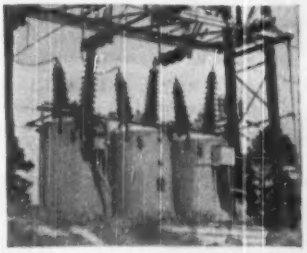
THE ELECTRIC STORAGE BATTERY CO., Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

"Exide" and "Manchex" *Reg. Trade-marks U. S. Pat. Off.*

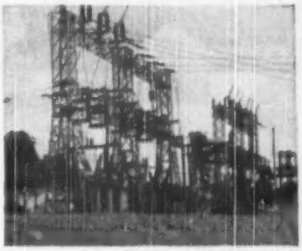
1888 . . . DEPENDABLE BATTERIES FOR 62 YEARS . . . 1950



60-cell Exide-Manchex switchgear control battery, EME-13, mounted on two, 2-step racks.



132,000-volt, 600-ampere oil circuit breaker, operated by Exide-Manchex Batteries.



A part of the 114 K.V. Switchyard showing three bays of high voltage switchgear.

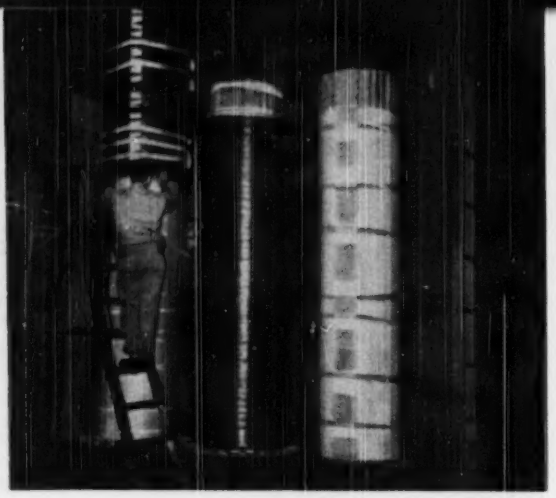
HIGH SPEED PROTECTION
LOW IMPULSE CHARACTERISTICS
FAST MULTI-GAP SPARK GAP OXIDIZED
SILICON CARBIDE VALVE ELEMENT
All are features that make possible the high-speed operation of Crystal Valve Lightning Arresters . . . assure your equipment and service of extra protection against lightning "blackouts."
Speed of operation is controlled largely through spark gap design and construction. Crystal Valves embody time-proved spark gap units of multi-gap construction and sparkover or discharge surfaces that are smooth and flat.
Oxidized Silicon Carbide, today's most highly developed valve element, is an exclusive feature in Crystal Valves. It provides:
• Low IR voltage drop and ample surge voltage reduction, with adequate surge energy absorption.
• Extremely marked valve action for follow current interruption.
• Long life since no measurable deterioration occurs after years of normal service.
Specify proved protection . . . order Crystal Valves. Write today and let us put your name on the list to receive our series of instructive booklets on lightning protection.
LIGHTNING ARRESTERS
ESM

ELECTRIC SERVICE MANUFACTURING CO. • 1709 Cambria St. • Philadelphia 32, Penna.

CRYSTAL VALVE
LIGHTNING ARRESTERS

Tirex Cables
Can Take It!!
NAME YOUR HAZARDS; the hazards that time and again raise havoc with the portable cords and cables you depend upon for the efficient operation of vital electric equipment.
Water, snow and mud as pictured here; dragging over rough surfaces and pulling around sharp bends; runovers by heavy mobile equipment; grease, oil, chemicals, sunlight, heat and flame — a few, perhaps all of these cable enemies are writing "down time" into the performance records of your equipment.
You can beat the problem, simply, economically, by specifying Simplex-TIREX Cords and Cables when you next order. The TIREX line is performance proved — proved in the field under the most severe conditions during more than a quarter-century of service to all industries. It includes cords and cables that meet the requirements of all portable electric apparatus. All are jacketed with cured-in-lead Selenium Neoprene Armor, the toughest, most-reliable protection available for portable cords and cables.
If you would like complete information write us today for a TIREX Catalog, specifying the voltage range you are principally interested in.
SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

1 PLANNING BEST WAY to expedite vital 20,000 kva power transformer from drawing board to installation, A-C engineers Maise, Ashbaugh and Cook review specifications.



2 20 TONS of high-grade electrical steel is built into core. Core is 5-legged double magnetic circuit design, to keep tank height low. Cap protects low voltage coil from abrasion as it is lowered on core leg.

20,000 KVA TAKES LOAD OFF SOUTHWEST'S SHOULDERS

3 TO WITHSTAND PRESSURE of tons of oil, tank seams will be tested at a vacuum of 28" mercury. Submerged arc welding process produces a controlled, continuous weld.

FROM AIR CONDITIONING SYSTEMS for skyscrapers to mile-deep oil wells, new commercial and industrial load requirements placed a heavy burden on the power distribution system of an expanding Southwest city.

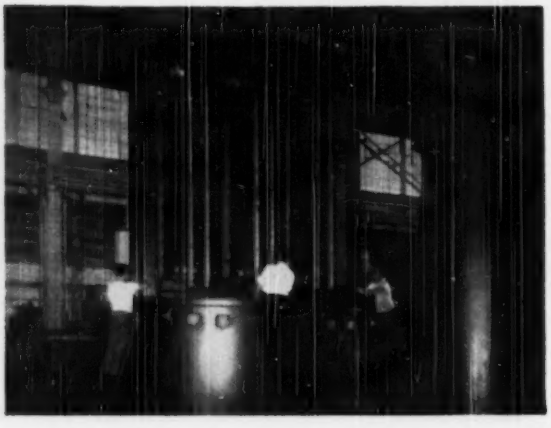
Until . . . this 20,000 kva Allis-Chalmers power transformer was installed to serve the downtown network area, and several outlying substations.

Whether 20,000 kva or the world's largest physical size transformer, such as recently completed, Allis-Chalmers has the engineering experience and facilities to build power transformers of *any* rating . . . to meet *any* system needs.

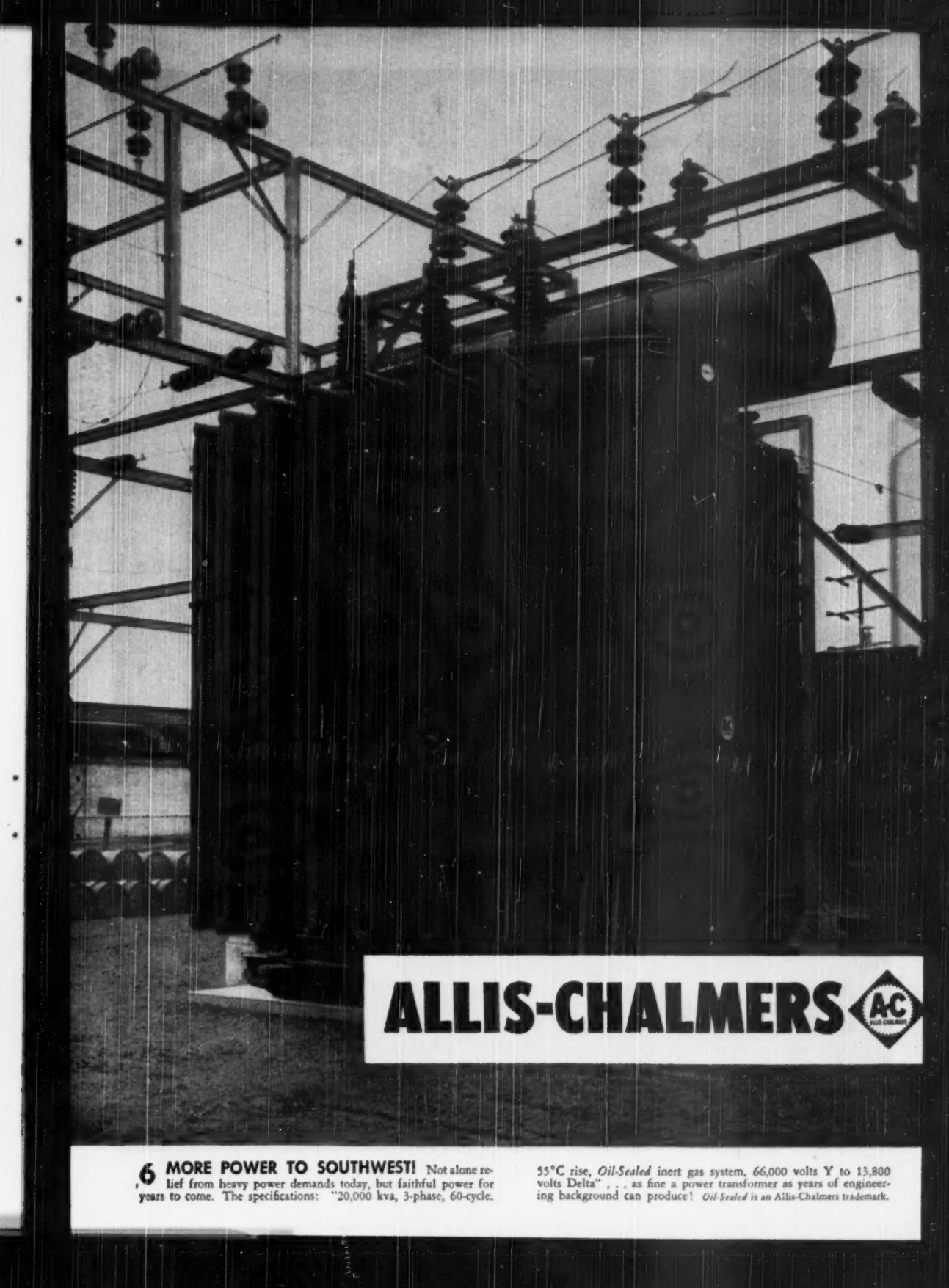
A-2982

ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.

4 HUGE 400 TON HYDRAULIC PRESS assures a high degree of accuracy in fabricating bosses, frames, covers, etc. Press is also used to dome cover so that it will shed water.



5 DOWN SHE GOES for a preliminary fit. This permits faster tanking after dry-out to maintain high dielectric strength of insulation. Notched end plates guide and accurately position assembly.



6 MORE POWER TO SOUTHWEST! Not alone relief from heavy power demands today, but faithful power for years to come. The specifications: "20,000 kva, 3-phase, 60-cycle, 55°C rise, *Oil-Sealed* inert gas system, 66,000 volts Y to 13,800 volts Delta" . . . as fine a power transformer as years of engineering background can produce! *Oil-Sealed* is an Allis-Chalmers trademark.

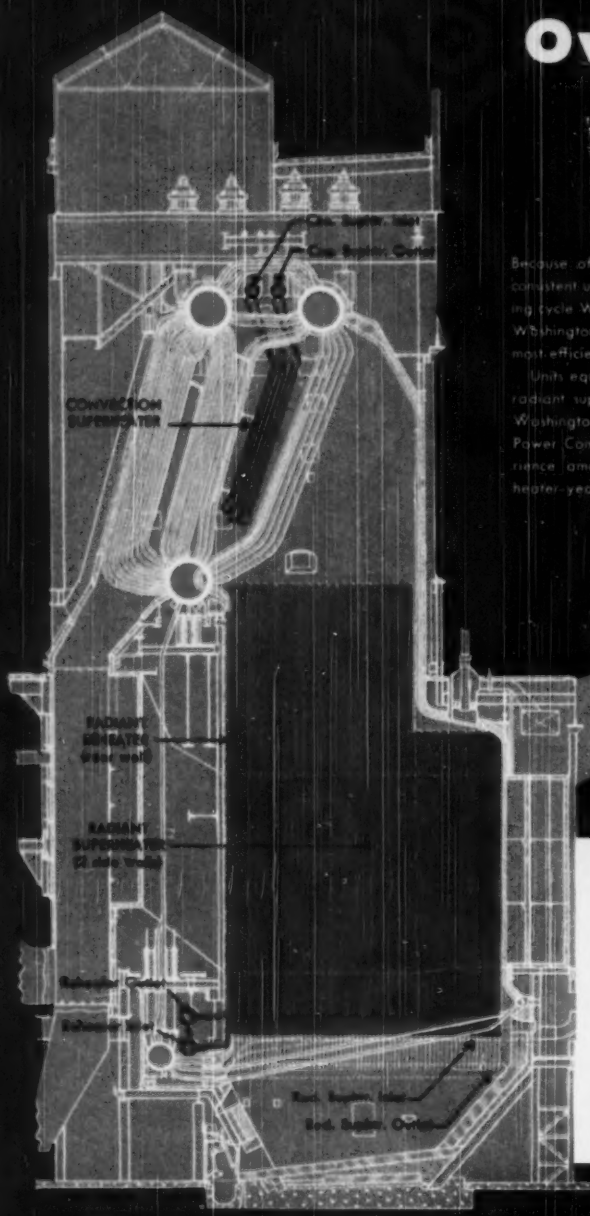
Over 500

Because of a farsighted program involving the consistent use of a high temperature resuperheating cycle Wisconsin Electric Power Company's Port Washington Station is today one of the country's most efficient power plants.

Units equipped with FW radiant reheaters and radiant superheaters at both Lakeside and Port Washington Stations of the Wisconsin Electric Power Company show a total of successful experience amounting to over 500 "radiant superheater-years."

1949

FOSTE



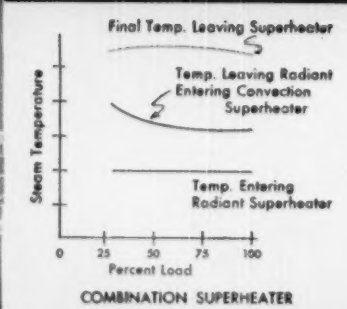


Fig. 1
Note flat final steam temperature

FOSTER WHEELER CORPORATION

"radiant superheater-years"

in one utility alone*

*See TRANSACTIONS of the ASME, August, 1949, page 738

1948 1943 1935 1929

FOSTER WHEELER RADIANT REHEATERS and SUPERHEATERS

Foster Wheeler Reheat and Radiant Superheaters. Foster Wheeler experience in the design and operation of radiant and convection surface dates from 1902 with the introduction of commercial use of superheated steam into the United States. ***A wider selection of fuels*** for resuperheating units may be obtained by using superheaters and reheaters which include F-W radiant heat absorbing sections. This is in sharp contrast to the all convection type which will provide a wide range of steam temperature control at the risk of considerable slagging in both furnace and hotter convection zones. This also applies in the case of non-reheat units with wide control ranges. Performance data on units equipped with F-W radiant surfaces for superheating and resuperheating at the Lakeside and Port Washington Stations of the Wisconsin Electric Power Company also testify to such advantages as ***a very high operating reliability*** and ***the compensating effect in temperature characteristics*** as against exclusively convection arrangements with steep load temperature curves (see figures 1 and 2). The fact that 35.6% of the total BTU duty on Unit No. 5 at Port Washington will be performed by the superheater and reheater well illustrates the magnitude of this function of a modern steam generator.

To date, four units incorporating F-W radiant reheating and radiant and convection superheaters have been installed in the Port Washington Station. The fourth unit was started in August 1949 and a fifth is in fabrication. The combined availability of the first three operating units, the initial one of which was installed in 1936, is 95% for a total of 147,235 hours of service as of December 26th, 1948.

For further information, write for Paper No. 48-A-120

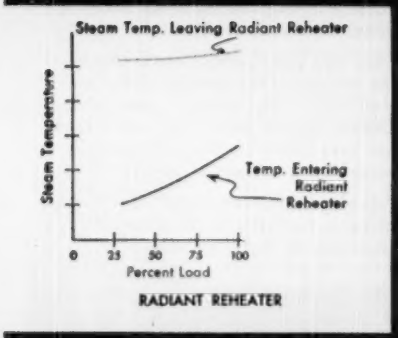


Fig. 2
characteristics over wide load ranges

103 BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER

CALL YOUR CENTRAL CONDUIT DISTRIBUTOR WHEN YOU NEED...

a HELPING HAND

You'll find that your Central Conduit Distributor is *always* ready to give you a helping hand. He's built an organization that has a reputation for service and he's determined to keep it that way.

You'll find, too, that your Central Conduit Distributor offers a wide selection of fine products. Take Central Conduit, for example. There are three types to choose from . . . *Cenlaco, Central White* and *Central Black*. Each type measures up to the high standards that have made the name Spang famous for quality.

Whenever you need a helping hand, call your Central Conduit Distributor. You'll like all the products he has for sale and his way of doing business.

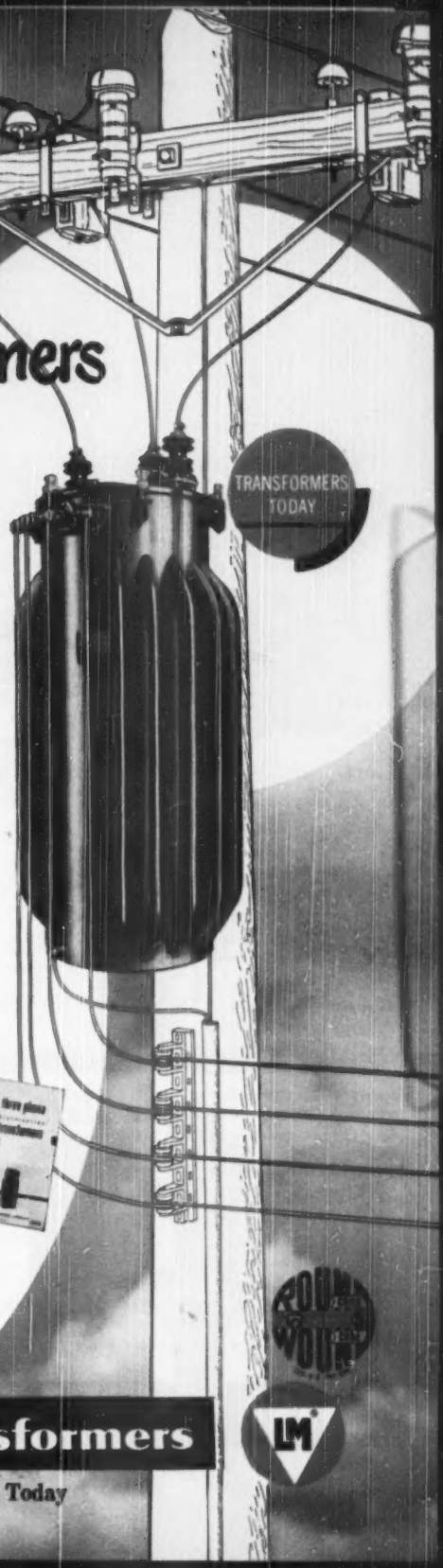
CENLACO a hot dipped galvanized and lacquered finish, inside and out.

CENTRAL WHITE electro-galvanized outside and black enameled inside.

CENTRAL BLACK permanent, baked-on black enamel finish, inside and out.

SPANG-CHALFANT
Division of The National Supply Company
General Sales Office: Grant Building, Pittsburgh, Pa.
District Offices and Sales Representatives in Principal Cities

YOU MAKE THESE 3 SAVINGS WITH L-M 3-phase Transformers



1. INSTALLATION:

It's simpler to hang and wire one 3-phase transformer than a bank of three single-phase units—and it's safer, too!

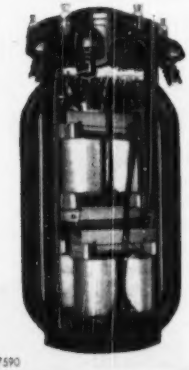
2. POLE SPACE:

L-M sizes through 112½ kva can be bolted directly to the pole. You eliminate additional cross arms and get greatly improved appearance.

3. OPERATING COST:

The impedances of all three units in a 3-phase transformer are identical. This eliminates the circulating currents and losses in operation which may occur in banks of three single phase units.

Perhaps you, like many others, would like more information on the relative advantages of 3-phase transformers and single-phase banks. If you care to drop your problem in our lap, we'll be glad to work with you. Ask the L-M Field Engineer, or write Transformer Division, Line Material Co., Zanesville, Ohio (A McGraw Electric Company division).



7590

Ratings from 9 to 150 kva have famous L-M "Round-Wound" construction with its many advantages. Ratings from 225 to 500 kva have *round* coils on a three-legged stacked core; these offer many advantages not inherent in square-coil construction. For data and dimensions write for Bulletin DT5.

Three core-coil units mounted in one rigid frame, for best cooling and maximum accessibility. Any one of the three units may easily be removed and replaced if necessary.

LINE MATERIAL... Transformers

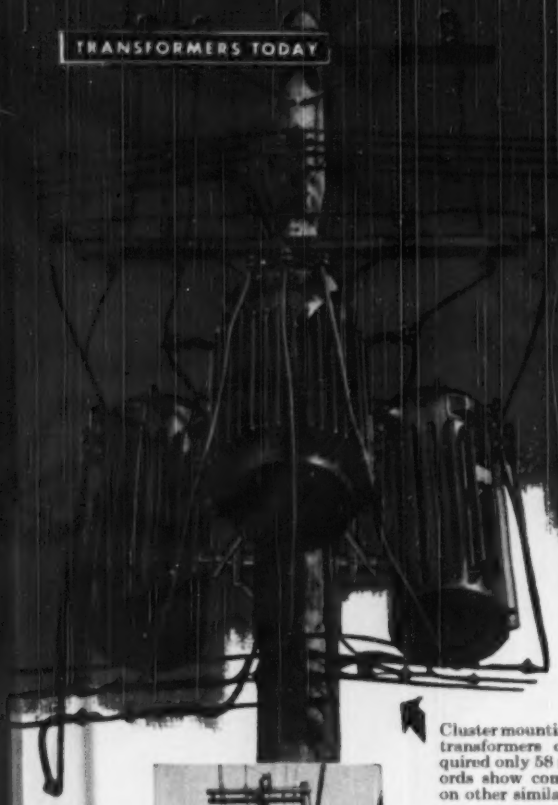
Complete Coordinated Equipment for Distribution Today

TRANSFORMERS TODAY

HOW TO hang 3 Transformers on one pole

AND SAVE 24 MAN-HOURS

by George Hindman,
Estimating Supervisor,
Overhead Lines Department,
Detroit Edison Company.



Cluster mounting of three 75 kva transformers on one pole required only 58 man hours. Records show comparable savings on other similar installations.

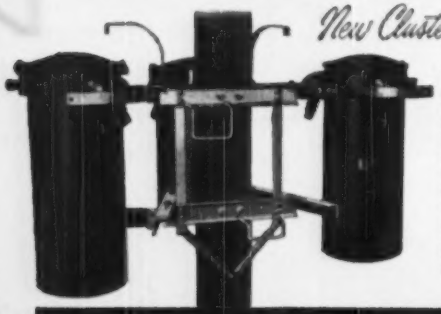
The Old Way

The old way—hanging these three 75 kva transformers on three poles required 82 man hours.

To avoid the increasing use of two-pole platforms for transformer banks, the author developed the idea of supporting two or three single phase transformers on a single pole with a specially designed hanger.

This is now readily done with the L-M Cluster Mounting Frame, which holds from two 25 kva up to three 100 kva transformers. The frame balances the load and provides adequate climbing space.

Its use results in a *substantial saving* in labor and material, through elimination of heavy primary and secondary busses, extra poles, platforms, etc. *Electrical characteristics* are improved because the transformer bank is mounted nearer its load, effecting a saving in secondary copper and improving secondary voltage. Appearance is improved as well, by L-M's Cluster Mounting Frame.



New Cluster Mounting Frame

The new L-M Cluster Mounting Frame, which hangs anywhere from two 25 kva to three 100 kva transformers on a single pole. This bracket was developed from the idea of George Hindman of Detroit Edison Company. Mr. Hindman was awarded Detroit Edison's Alex Dow award for this idea.

For further information ask the L-M Field Engineer or write Transformer Division, Line Material Co., Zanesville, Ohio, for Bulletin 49001. (Line Material is a McGraw Electric Company Division.)

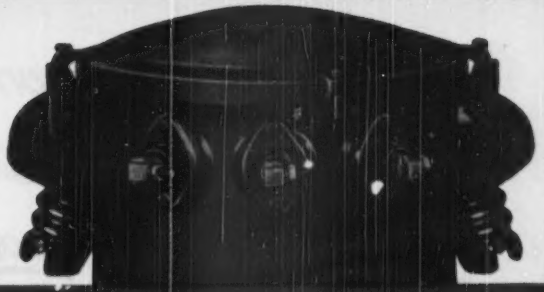
7589

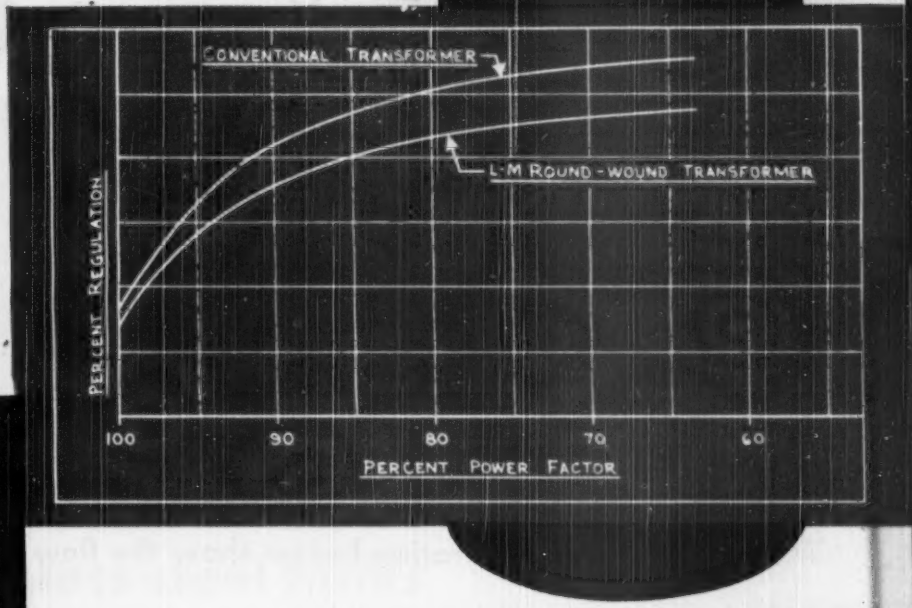
LINE MATERIAL ... Transformers

Complete Coordinated Equipment for Distribution Today

LM

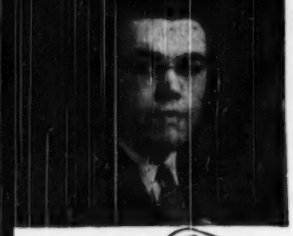
"Better regulation at all power factors...



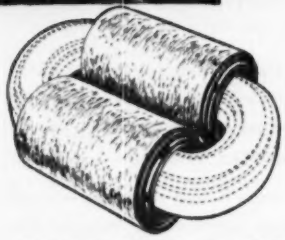


ROUND WOUND

Robert P. Thompson,
Transformer Design Engineer,
Line Material Company,
Zanesville, Ohio



a major advantage of L-M ROUND-WOUND transformers," says ENGINEER THOMPSON

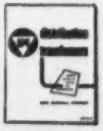


Continuous wound core, which is never cut, unwound, or disturbed in any way after annealing, because the long round coils are wound directly onto the core by L-M's ingenious Round-Wound method.

"There's no patent on designing good regulation into a transformer," says Mr. Thompson. "The problem is to get good regulation *without* sacrificing other desirable characteristics, *and* without increased cost to the user.

"We are able to solve the problem with our wound core which is not cut, unwound or disturbed in any way after annealing, resulting in uniformly stable core loss and low exciting current. The compact cruciform cross section shape of the Round-Wound core enables the designer to use long round coils with fewer turns and smaller mean turn diameter, thus gaining lower resistance and reactance values. Uniformly low impedance with improved regulation at all power factors—both recognized features of real significance under today's operating conditions—are outstanding features of the Round-Wound transformer."

Want to know more about the savings "Round-Wounds" offer the utility company? Want to know more about how L-M Round-Wound transformers are designed, why they give "Balanced Performance" and operating benefits to the user, better service to the customer? Ask the L-M Field Engineer for this fact-packed bulletin No. 16-G-1, or **write Transformer Division, Line Material Co., Zanesville, Ohio.**



LINE MATERIAL Transformers

Complete Coordinated Equipment For All Distribution Requirements

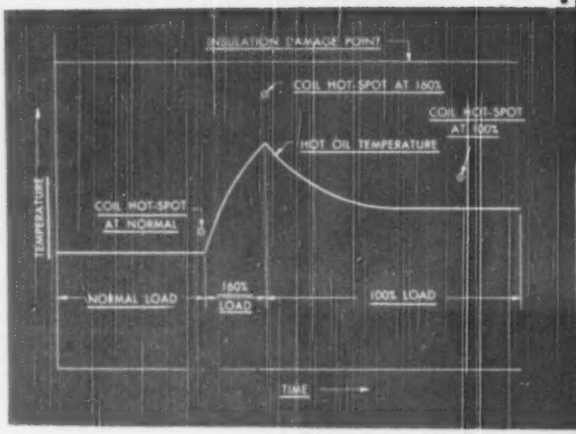
LM

high short time overload capacity because L-M "ROUND-WOUNDS" have built-in cooling

Obviously no transformer that develops hot spots because of insufficient coil ventilation will take much of an overload, even for a comparatively short time.

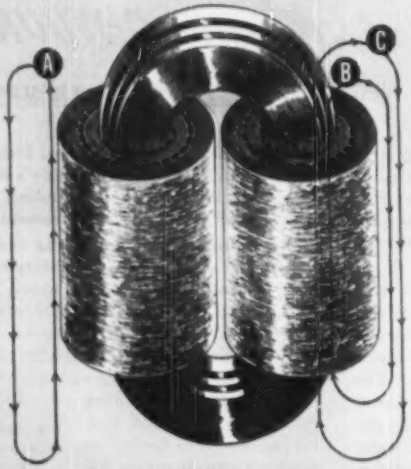
So, to assure real short-time overload capacity, L-M engineers designed a core which has inherently good coil ventilation characteristics. That's what we mean by a cooling system.

No—we aren't recommending Round-Wound 5 kva's for a 10 kva job! But we *do* say that you can expect long life, with an extra margin of short time overload capacity, because of the superior coil cooling of the Round-Wound design.



Typical time-temperature curve for Round-Wound transformers.

The arrows in the illustration below show the flow of cooling oil



Arrows show oil circulation around and through the long round coils, and between core and coils. Exceptional cooling characteristics inherent in the L-M Round-Wound design assure you of unexcelled short-time overload capacity.

As the illustration shows, L-M Round-Wound design provides long round coils which expose more surface (A) to the oil than do shell type transformers. What's more, the Round-Wound design provides oil ducts between the cruciform core and the coils (B) to cool the inner windings. And in the larger sizes we build oil ducts right into the coil windings (C) for still more oil circulation.

How are you going to develop critical hot spots with that kind of cooling? Temperature gradient between windings and top oil remains low, and insulation is protected against damage under severe loading conditions.

Exceptional coil cooling results in high short time overload capacity—one of the several fundamental "Balanced Performance" characteristics found in all L-M Round-Wound transformers. Want more details? Ask the L-M Field Engineer or write Line Material Company, Transformer Division, Zanesville, Ohio.

ROUND-WOUND X-CORE

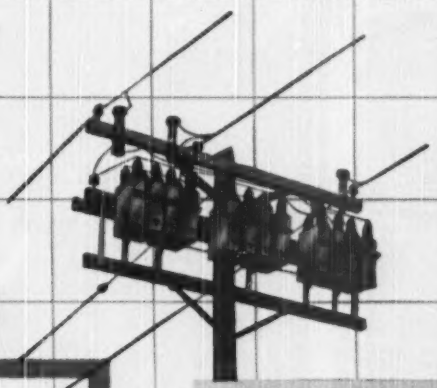
LM

LINE MATERIAL Transformers

Complete Coordinated Equipment for All Distribution Requirements

DOWN GOES THE COST PER KVAR WITH

ELEMEX capacitors in stainless steel tanks



Want to save some real money? You can, by installing good capacitors to improve power factor and lower line losses. For even greater savings choose ELEMEX capacitors, whose stainless steel tanks never need painting!

When you eliminate painting, you soon pay for the slightly higher first cost of ELEMEX capacitors. Then you begin to pile up worthwhile savings—a real aid in combatting constantly rising maintenance costs.

ELEMEX capacitors offer many other advantages: conservative design with low unit stress for long life; individual evacuation, capillary impregnation, and constant testing in production; "Hydis" surface treatment for high heat dissipation; Paragroove connectors to simplify installation; L-M "Lifetime" solder-sealed bushings.

Throw away your paint brush! Get ELEMEX long-life capacitors in stainless steel tanks. Get the whole story; ask the L-M Field Engineer for Bulletin PC1 or write Line Material, Capacitor Division, Milwaukee 1, Wisconsin (A McGraw Electric Company division).

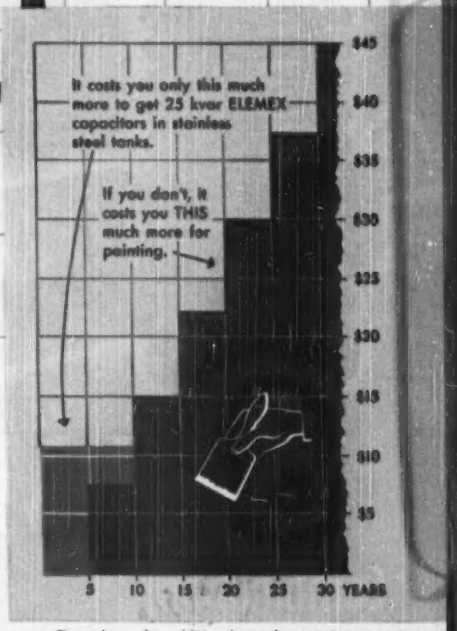
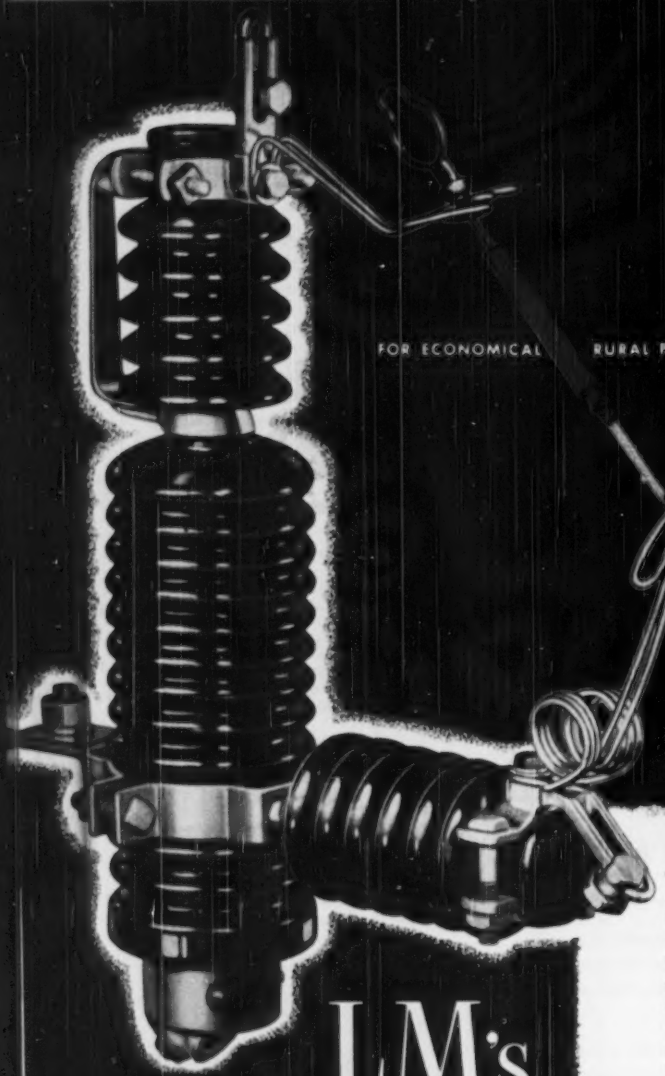


Chart shows the additional cost for painting capacitors, based on utility company averages of $7.50 per job, every five years. (15 kvars cost only $6.75 more than mild steel. The first paint job more than pays the difference.) Costs and periods vary with local conditions and practices—but on the average, you'll be ahead of the game on the second paint job! Because of the long life of ELEMEX capacitors, you'll make plenty of savings! (Utility cost estimates are based on the fact that it's almost impossible to paint a capacitor on the pole, and units are usually taken down and into the shop while a freshly painted bank is installed.)

7420

LINE MATERIAL . . . Capacitors

Complete Coordinated Equipment for Distribution Today



FOR ECONOMICAL RURAL PROTECTION TODAY

LM's Combination Arrester and Cutout

Saves 20%

Two well-known L-M products have been combined to create the Combination Lightning Arrester and Fuse Cutout—the 9 kv "PF-3" Expulsion Arrester and the 7.5 kv Open-Link "STF" Cutout.

This combination is designed to provide complete low-cost transformer protection on rural lines rated at 7200/12470 and 7620/13200 volts grounded wye.

This unit-combination costs 20% less than the same size arrester and cutout ordered separately. Installation costs, too, are lower, since it is necessary to mount only one, rather than two, units.

The PF-3 arrester has a rated discharge capacity of 65,000 amps, meets all AIEE and NEMA standards. The cutout has a continuous current carrying capacity of 50 amps and 600-amp interrupting capacity. The fusible link is contained in an arc-extinguishing sleeve which confines the arc, assuring successful clearing of a fault. Constant tension on the link assures rapid separation of link parts with no possibility of re-establishing the arc.

Re-fusing is easy and safe. With hot stick in fuse link top loop, the lower end of the link is hooked into the lower contact. The top end of the link is then pulled up and seated in the upper contact. This combination is REA-accepted.

For details ask the L-M Field Engineer, or write Line Material Company, Milwaukee 1, Wis. (A McGraw Electric Company Division).

LM **LINE MATERIAL...Protective Equipment**

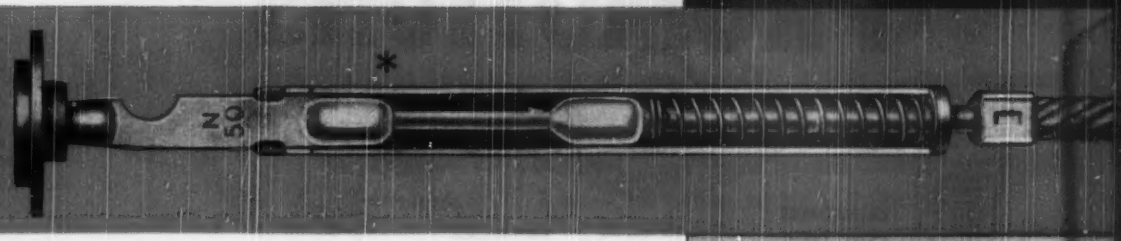
Complete Coordinated Equipment for Distribution Today

7459

She bets we'll be wrong... in either case, YOU WIN!

Every L-M UNIFIT FUSE LINK is individually tested

One of our trained inspectors who's paid to find trouble in every fuse link we make. If there is anything wrong, she'll find it. That's why you don't!



One bad apple may spoil the barrel. One bad fuse link could make a lot of trouble for our customers. So, to assure complete reliability, we test every individual L-M fuse link. Not one in a thousand, not spot checking, but *every one*, gets the "works." Tested for accuracy! Tested for coordination! Tested for strength, and mechanical construction!

We think L-M is the only fuse link manufacturer giving 100% inspection. It takes more work—sure—but that's why L-M links have such an enviable reputation for accuracy—especially among men to whom precise coordination is important. For details on L-M's very complete line of fuse links, ask the L-M Field Engineer or write *Line Material Co., Milwaukee 1, Wisconsin.*

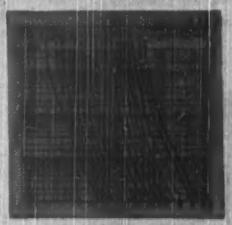
Fuse Coordination your problem?

In addition to making our fuse links so they will coordinate, we have developed a fairly complete manual on Fuse Coordination. Men who have used it have been very complimentary about it. If you have a fuse coordination problem and would like a copy, drop us a note.

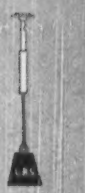
*Only L-M can give you a link like the one shown above! This is a 50-amp spring type link in die-cast construction, an L-M exclusive process!

Here's what our inspectors check:

A Accuracy of Rating for Precise Coordination:
Every link must coincide closely with the melting and clearing time curves. Millivolt tests show whether the link is accurate. If not, out it goes—to the scrap pile, *not* to the customer. That's why you can depend on L-M links for coordination.



B Pull Test:
NEMA specifies a 10 pound test so that links won't pull apart needlessly under cutout tension. Ours pass that test with a good margin of safety—or you never get them!



C Physical Inspection:
To weed out any other possible faults. Every L-M link gets a pretty critical once-over—it's gotta be good!

LINE MATERIAL Fuse Links

Complete Coordinated Equipment for All Distribution Requirements

THERE'S LOADS OF

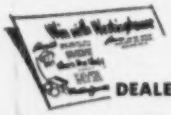
POWER

IN THESE WESTINGHOUSE

PROMOTIONS

CONSUMER CONTESTS:

Have set a new high in light bulb sales-making power. The latest "Who Is Miss Wink" contest is running April 1 to May 31.



DEALER CONTESTS:

Are providing point-of-sale incentive which result in bigger and better displays . . . and sales.

TELEVISION:

Westinghouse "Studio One" TV program named "outstanding" by viewers is adding power to Westinghouse light bulb promotions.

RAILROAD TERMINAL DISPLAYS:

Unique in light bulb advertising, these giant mechanical displays are effective with millions of travellers.

"LIGHT UP FOR SPRING"

is the sales-sparking theme of the current electric service company bag promotion sponsored by Westinghouse.

NATIONAL ADVERTISING

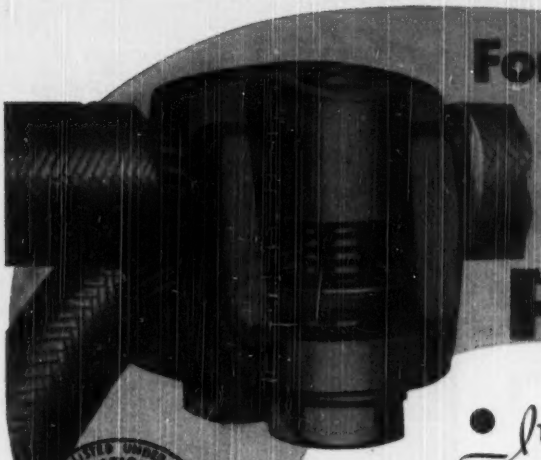
carries year-round messages promoting light bulbs and greater See-Ability.

TO INCREASE LIGHT AND LOAD . . .

Westinghouse conducts a continuing series of sparkling and effective light bulb promotion throughout the year. New contests are being readied for Fall . . . national advertising is being stepped up . . . point-of-sale activity is steadily accelerating. Electric Service Companies are invited to tie in with the load-producing power of these Westinghouse promotions. Lamp Division, Westinghouse Electric Corp., Bloomfield, N. J.

YOU CAN BE SURE...IF IT'S Westinghouse

For Heavy Duty Connections use the PENN-TAP

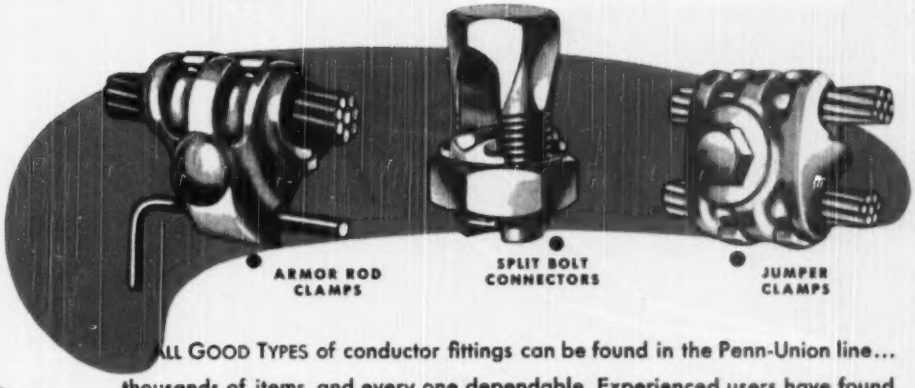


LISTED UNDER RE-EXAMINATION SERVICE UL UNDERWRITERS' LABORATORIES, INC.

• IT'S more sturdily constructed . . . exceptionally tough silicon bronze alloy and more of it, giving extra strength at no added cost.

For taps, service entrance connections, dead ends . . . indoor or out. Quickly installed with ordinary wrench. Recessed bolts for easy taping.

ONE PIECE—no loose parts . . . swivels on one locked bolt. Holds tight permanently. 7 sizes, for cables 10 Str. to 1,000 MCM.



ALL GOOD TYPES of conductor fittings can be found in the Penn-Union line... thousands of items, and every one dependable. Experienced users have found that "Penn-Union" on a fitting is *their best guarantee of unfailing service.*

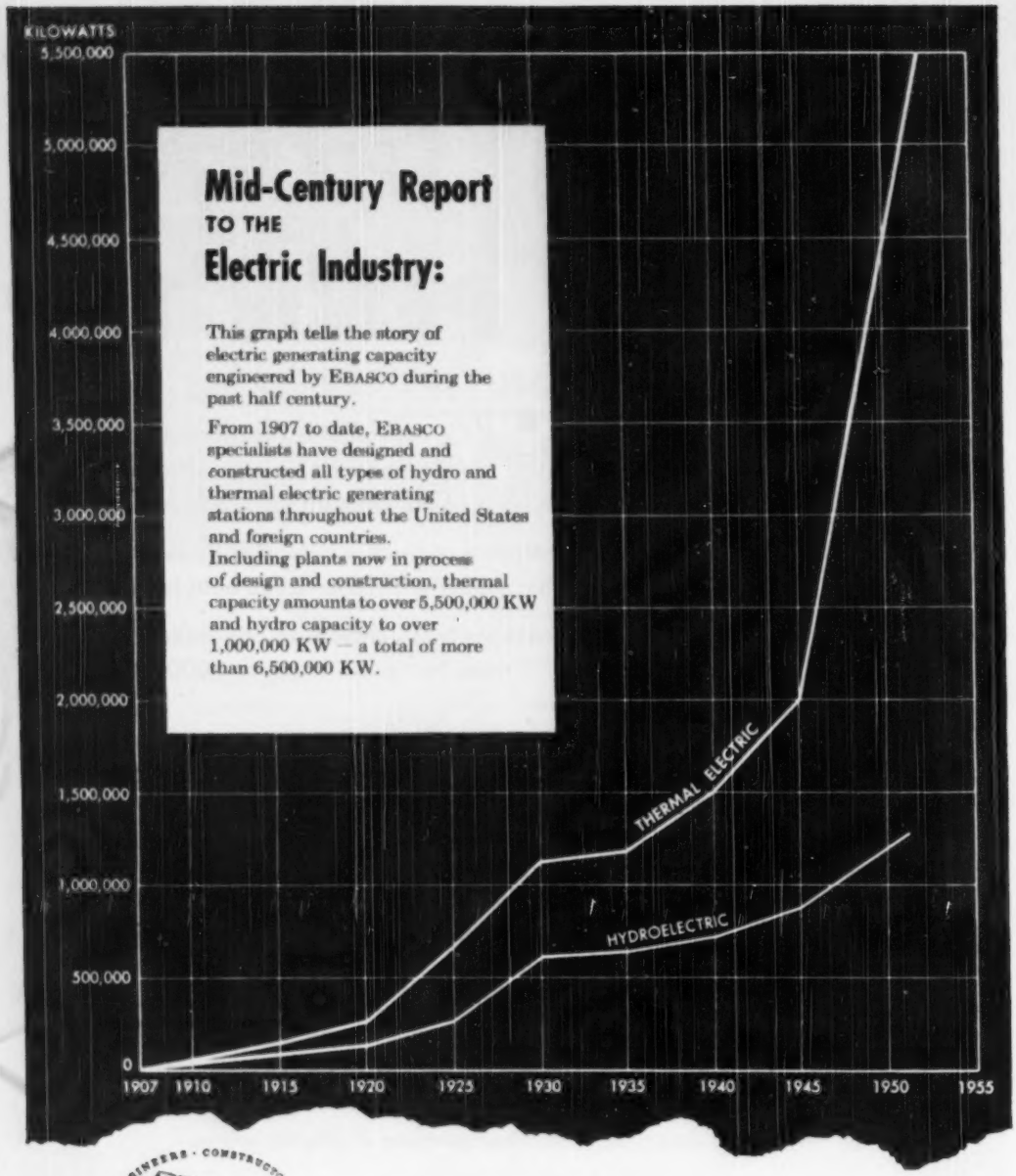
Sold by Leading Wholesalers

PENN-UNION ELECTRIC CORPORATION • ERIE, PA.

Canada: Dominion Cutout Company, Ltd., 250 Richmond Street, West, Toronto

The *Complete* LINE of CONDUCTOR FITTINGS

PENN-UNION



Mid-Century Report
TO THE
Electric Industry:

This graph tells the story of electric generating capacity engineered by EBASCO during the past half century.

From 1907 to date, EBASCO specialists have designed and constructed all types of hydro and thermal electric generating stations throughout the United States and foreign countries.

Including plants now in process of design and construction, thermal capacity amounts to over 5,500,000 KW and hydro capacity to over 1,000,000 KW — a total of more than 6,500,000 KW.

ENGINEERS · CONSTRUCTORS · BUSINESS CONSULTANTS
EBASCO

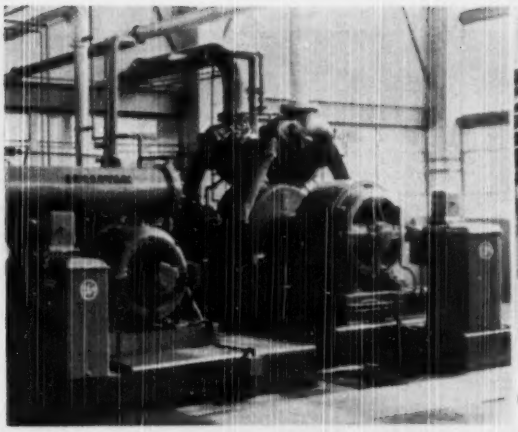
Write for the booklet "*The Inside Story of Outside Help*" describing the many Ebasco services available to you. Ebasco Services Incorporated, Dept. M, Two Rector Street, New York 6, N. Y.

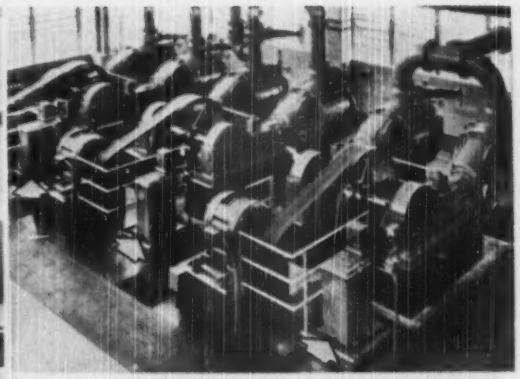
Appraisal	Design & Construction	Insurance & Pensions	Sales & Marketing
Budget	Financial	Purchasing	Systems & Methods
Business Studies	Industrial Relations	Rates & Pricing	Taxes
Consulting Engineering	Inspection & Expediting	Research	Traffic

EBASCO SERVICES
INCORPORATED

NEW YORK · CHICAGO · WASHINGTON, D. C.

Ebasco Teamwork gets things done anywhere in the world





. . . ON AIR COMPRESSORS . . . ON VACUUM PUMPS

In Protected Rooms, in Coastal Atmospheres, in Dusty Locations...

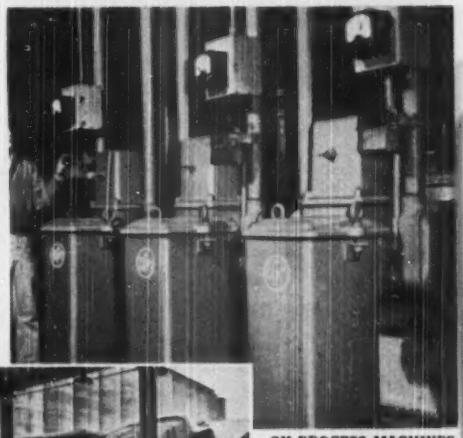
EC&M OIL-IMMERSED MOTOR STARTERS

HELP SPEED PRODUCTION IN GULF COAST PLANT

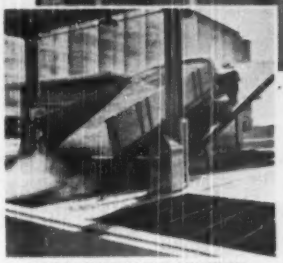
These EC&M reduced-voltage Motor Starters are very popular in industrial plants. *Automatic operation* from push-button stations brings squirrel-cage or synchronous motors up to speed quickly, safely—with greater skill than human hands can do it.

Oil-immersed, the simple double-throw contactor is always well lubricated and protected from corrosion—eliminating the need for frequent inspection or maintenance. Motor circuits are made and broken under oil—thoroughly safe, no dust hazards.

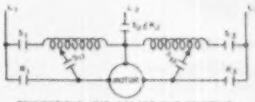
Magnetic overload relays in these starters give inverse-time-element protection and also *trip instantly* on heavy over-currents. A magnetic balance in each relay absorbs heavy starting currents and allows a *low* current-setting for accurate protection under running conditions. EC&M Motor Starters have a reputation for low up-keep cost.



. . . ON PROCESS MACHINES



GRAIN RECEIVING STATION



CONNECTIONS FOR 220-550 VOLT STARTING

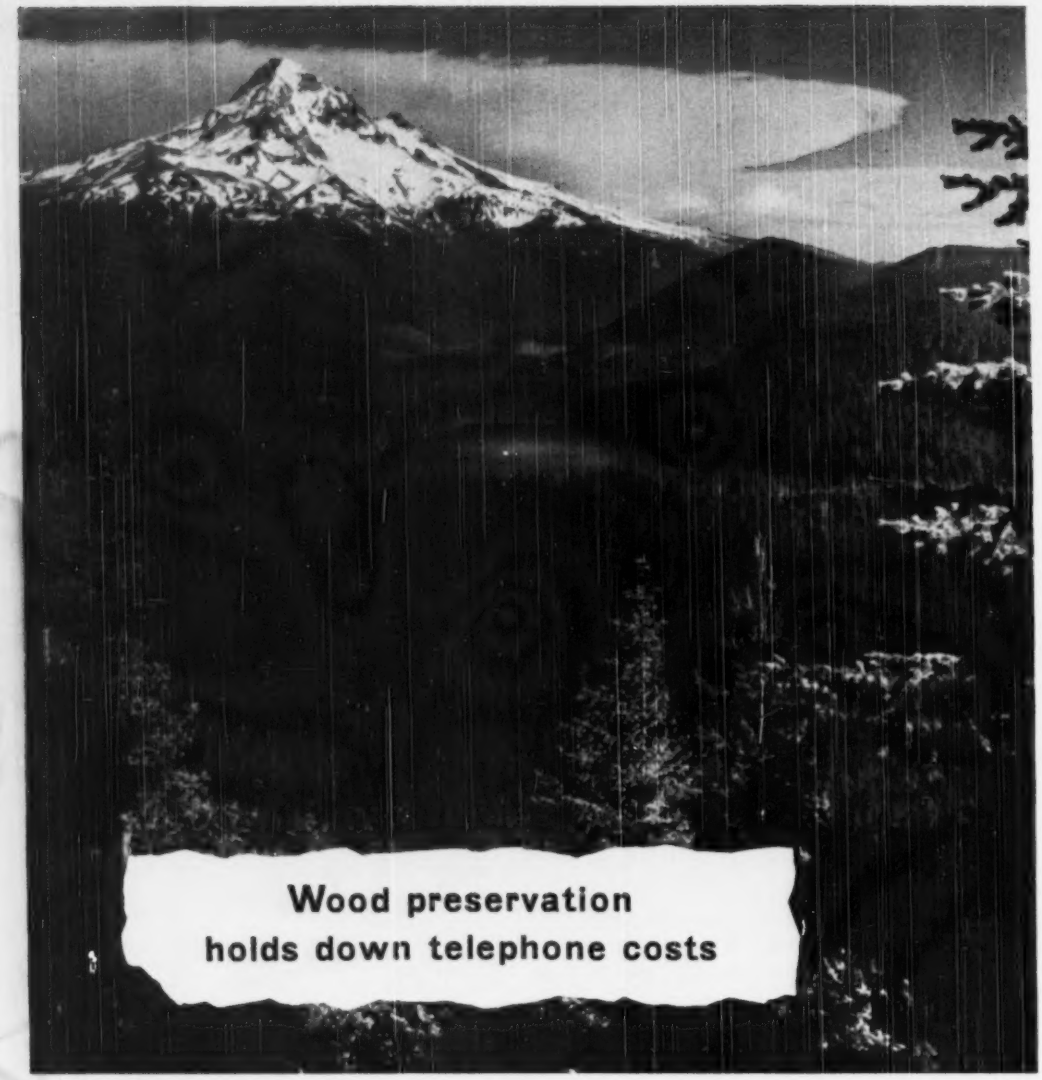
Complete compensator

Compensator mechanism

Write for Bulletin 1045 and No. 19 ACCELERATOR Bulletin

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79TH STREET · CLEVELAND 4, OHIO



Poles are a substantial part of the plant that serves your telephone; making them last longer keeps down repairs and renewals that are part of telephone costs. So Bell Laboratories have long been active in the attack on wood-destroying fungi, the worst enemies of telephone poles.

Better, cleaner creosotes and other preservatives have been developed in co-operation with the wood-preserving industry. Research is now being carried out on greensalt—a new, clean, odorless preservative. Even the products of atomic energy research have been pressed into service—radioactive isotopes are used to measure penetration of fluids into wood.

Treated poles last from three to five times as long as untreated poles. This has saved enough timber during the last quarter century to equal a forest of 25,000,000 trees. More than that, wood preservation has enabled the use of cheaper, quickly growing timber instead of the scarcer varieties.

This and other savings in pole line costs, such as stronger wires which need fewer poles, are some of the reasons why America's high-quality telephone service can be given at so reasonable a cost. It is one of today's best bargains.

BELL TELEPHONE LABORATORIES

Exploring and Inventing, Devising and Perfecting, for Continued Improvements and Economies in Telephone Service.

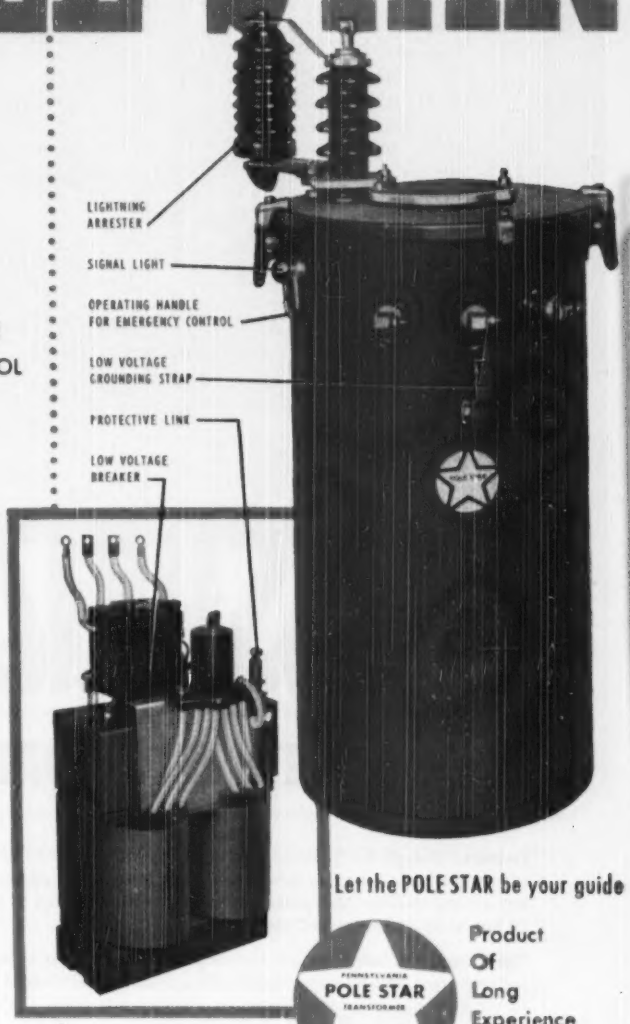
THERE ARE MANY PROTECTED POLE TYPE TRANSFORMERS

but only ONE PROTECTED

POLE STAR

TYPE CSP Equipped with

- LIGHTNING ARRESTERS
- PROTECTIVE LINK
- LOW VOLTAGE BREAKER
- SIGNAL LIGHT AND BREAKER OPERATING HANDLE
- EMERGENCY BREAKER CONTROL
- GROUND DISCHARGE GAP or GROUND CONNECTOR



MANY distribution transformers are equipped with safety devices for maximum electrical protection. But only the Transformer manufactured by Pennsylvania gives you this protection PLUS the many decided advantages of Pole Star design and construction.

IN THE POLE STAR, Pennsylvania gives you a small, light, efficient transformer. The exclusive *Pennsylvania-Developed* and *Pennsylvania-Engineered* design gives you a transformer with an inherent low exciting current and a core that can easily be disassembled and rebuilt without appreciably affecting the original core loss or exciting current. And, the POLE STAR gives you added protection with its Sealed Tank construction and retained synthetic rubber gaskets.

Let the POLE STAR be your guide

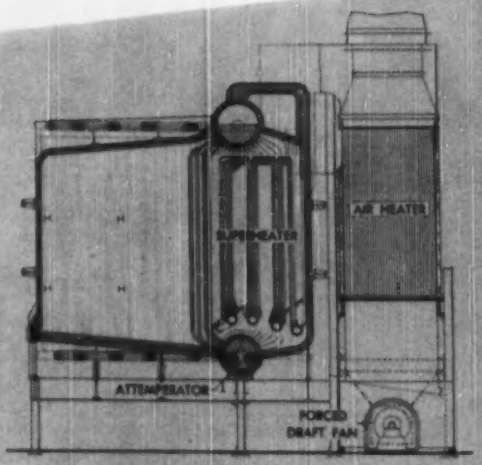
PENNSYLVANIA POLE STAR TRANSFORMER

Product Of Long Experience

Safe Thrifty And Reliable

Pennsylvania TRANSFORMER COMPANY

CANONSBURG, PENNA. *Greater Pittsburgh District*



B&W Integral-Furnace Boiler, Type FH, with pressurized casing, now in successful operation in outdoor central station installation. Design capacity is 300,000 lb. of steam per hr. at 875 psi and 910 F with gas-firing.

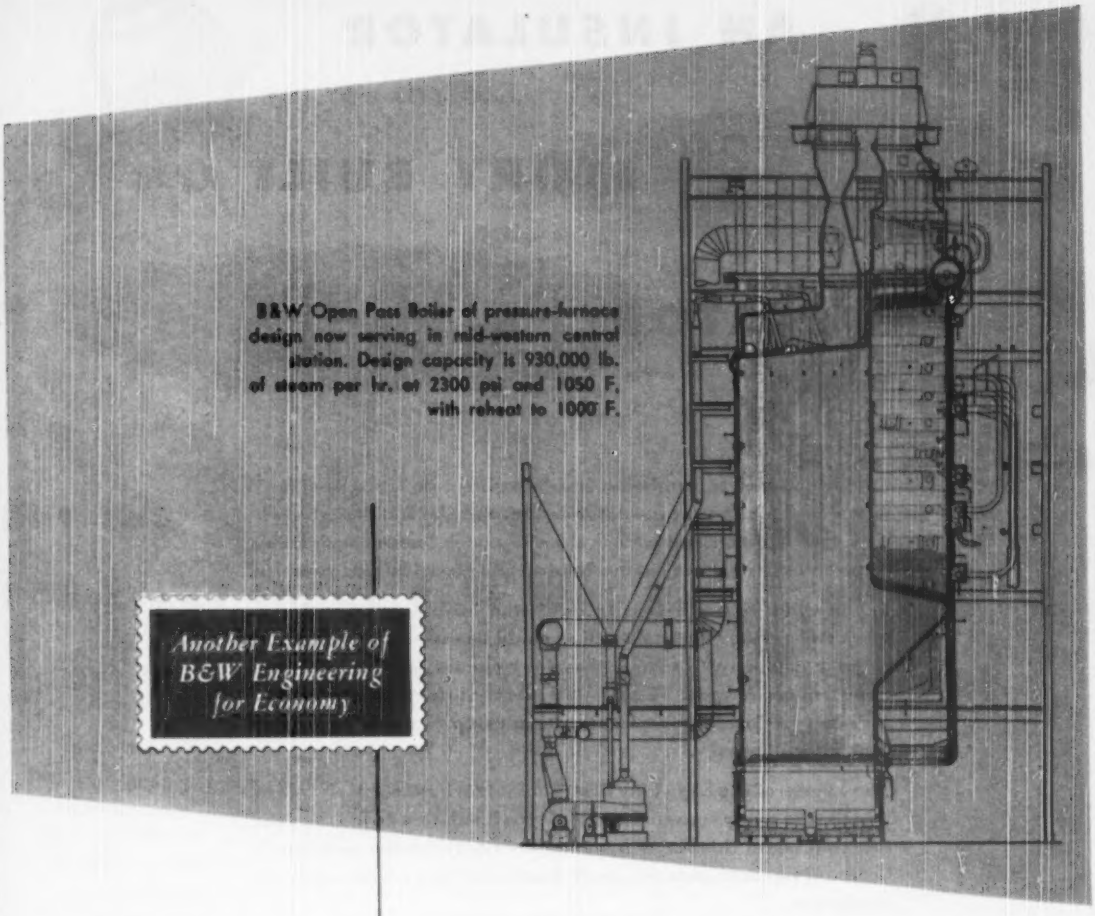
PRESSURIZED

FOR NEW ECONOMIES

Demand charge for Induced-Draft fan capacity may run as high as one-half of one per cent of gross generating capacity . . . an appreciable expense to any central station. Maintenance, too, is excessive because of constant exposure to hot gases and entrained abrasive particles.

These reasons help explain the importance of B&W's latest development —pressurized furnace construction. ID fans can be eliminated and users assured of the four big advantages listed on the opposite page.

A creative approach to boiler design and application, working in close co-operation with far-sighted managements and power engineers, has identified B&W with steam-power progress for more than 80 years. Perhaps it's just what is needed to effect significant steam-generating economies in the solution of *your* present problems or future plans.



B&W Open Pass Boiler of pressure-furnace design now serving in mid-western central station. Design capacity is 930,000 lb. of steam per hr. at 2300 psi and 1050 F. with reheat to 1000 F.

Another Example of B&W Engineering for Economy

. . . improved principle of boiler-furnace operation pioneered by B&W

. . . OFFERS MAJOR COST SAVING ADVANTAGES

1 Eliminates ID fan — lowers demand charge.

2 Prevents air infiltration — provides higher boiler efficiency.

3 Simplifies draft control — permits quick, easy, effective adjustment to optimum combustion conditions at all loads.

4 Simplifies design — lowers initial cost of duct and stack arrangement.

Helping Industry Cut Steam Costs Since 1867

BABCOCK & WILCOX

G-4857

AN INSULATOR SUCCESS STORY BUILT ON INSULATOR FAILURES

If conventional transmission insulators gave no trouble, there'd be no need for a better insulator design. But the fact is that a pin-type transmission insulator is a device which leaves considerable to be desired in the way of mechanical and electrical performance.

If you think that pin-type transmission insulators on your systems are serving "about as well as could be expected," you owe it to your company to take a good long careful look at your own maintenance records. We bet you'll find that the total annual cost for pin-type insulator replacements adds up to a mighty important piece of money.

The success of the Lapp Line Post insulator is built squarely on the fact that so many conventional pin-type insulators do fail, and the fact that use of this *better* insulator does cut maintenance cost in insulator replacements to a small fraction of that for conventional insulators.

We invite you to consider Lapp Line Posts as your transmission insulator standard—on this straight dollars-and-cents basis.

Lapp

LAPP INSULATOR COMPANY INC., LEROY, NEW YORK

NOT TOO LITTLE . . .

NOT TOO MUCH . . .

BUT THE RIGHT LIGHT FOR EVERY INDUSTRIAL NEED . . .

APPLETON LIGHTING EQUIPMENT

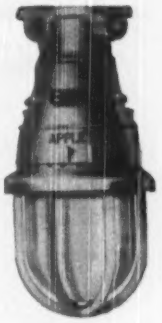
Here's lighting equipment that is designed for quick, easy and economical installation . . . that provides lasting, trouble-free, low-cost operation . . . that blankets every industrial illuminating requirement, whether indoors or out.

With Appleton Lighting Equipment you are assured of the utmost in illuminating efficiency . . . good light without uncomfortable glare or troublesome shadow. Appleton vitreous-fired porcelain enamel reflectors diffuse light generously, utilizing full power of the lamp, providing evenly distributed light over wider areas.

Sectionalized construction of Appleton Lighting Equipment assures easy cleaning and re-lamping. Rugged, weather-proof finish and materials mean longer life, greater adaptability. For the finest in lighting equipment, specify Appleton—Standard for Better Lighting.

Sold Through Electrical Wholesalers

Industrialite High Mounting Fixture
For use in railroad yards and roundhouses, steel mills, foundries, hundreds of industrial installations.



New Vented Type EVX
Explosion-Proof Fixture
Sturdily built of tough, malleable iron, this fixture provides safe superior illumination for hazardous locations. 10% greater light, 30% lighter in weight—cooler operating!

Type EFU Explosion-Proof Fixture
Up-to-the-minute version of the first fluorescent lighting fixture ever to be developed. May be hung vertically or at 45-degree angle.

APPLETON ELECTRIC COMPANY

1705 WELLINGTON AVENUE • CHICAGO 13, ILLINOIS

Branch Offices: NEW YORK, 50 Church St. • DETROIT, 3049 E. Grand Blvd. • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Mission St. • ST. LOUIS, 227 Frisco Bldg. • LOS ANGELES, 100 N. Santa Fe Avenue • ATLANTA, 724 Boulevard, N. E. • BIRMINGHAM 429 Brown-Marx Bldg. • MINNEAPOLIS, 305 Fifth St., S. • PITTSBURGH, 414 Bessemer Bldg. • BALTIMORE, 100 East Pleasant St. • BOSTON, 10 High Street • DENVER, 1921 Blake Street • PHILADELPHIA, 1017 Cherry Street • CINCINNATI, 626 Broadway • HOUSTON, 738 M. & M. Bldg. • HAVANA, Cuba, Malecon No. 9

Resident Representatives: Dallas, Indianapolis, Kansas City, Orlando, Milwaukee, New Orleans, Seattle

Export Representatives: International Standard Electric Corp., 67 Broad St., New York 4, N. Y.

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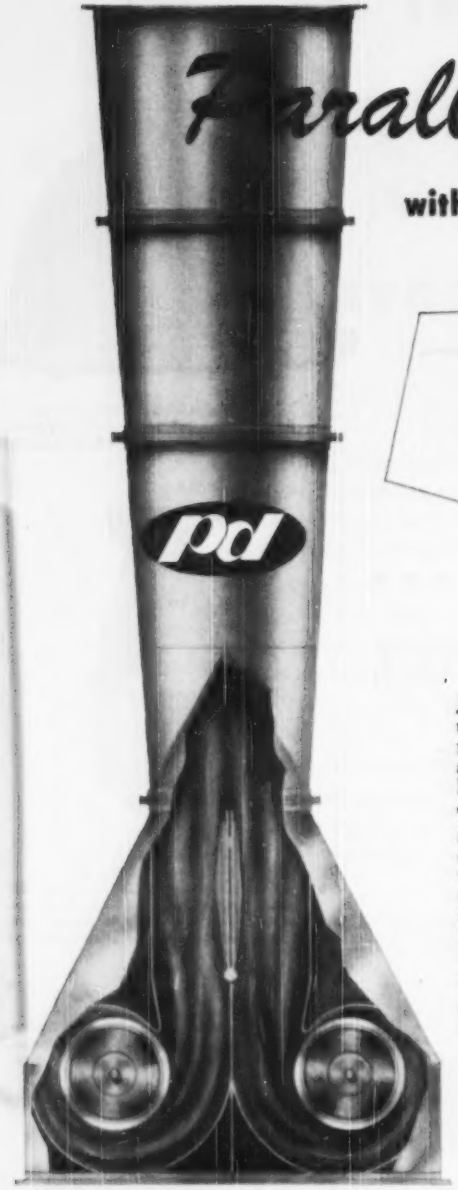
APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

Parallel Operation

with a BACKGROUND of OVER 30 YEARS



As shown in the illustration, either of two fans may be used and will generally carry approximately 70% of the normal load. The second fan can be arranged to start automatically when maximum capacity of the first fan has been reached.

Thus, a basic lower operation cost is realized and this safety factor assures continuous performance in the event of bearing or drive failure. In such an emergency, the boiler can be operated at 70% of normal load instead of a complete shut down, an important factor in large installations. Two boilers, operating from a Single, Twin Fan Stack can be arranged to operate either boiler from either fan.

Our project engineers have a background in fan-stack applications. Consult them for the answer to your draft problems.

Project and Sales Engineers

THE THERMIX CORPORATION

GREENWICH, CONN.

Canadian Affiliates

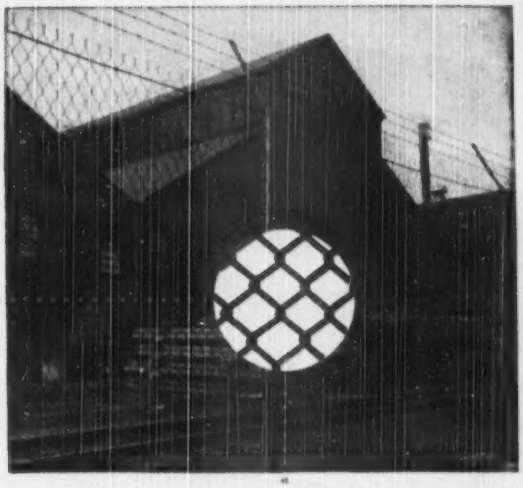
T. C. Chown, Ltd., 1440 St. Catherine Street W., Montreal 25, Quebec

PRAT-DANIEL CORPORATION

75-5 WATER STREET — EAST PORT CHESTER, CONN.

DESIGNERS AND MANUFACTURERS OF POWER PLANT EQUIPMENT

Here's a test of Copperweld wire



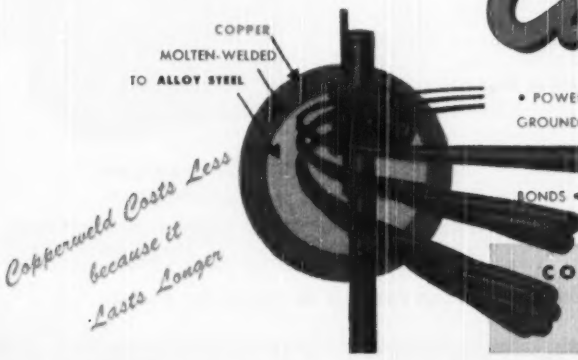
Observing "Copperwelders" have had the opportunity to inspect this Copperweld chain-link fence daily—ever since it was erected around our Glassport plant in 1927.

Being Copperweld, this fence has never required painting, yet it has been subjected to highly corrosive conditions 24 hours each day. It has resisted chemical fumes from the world's largest coke and by-product plant located nearby . . . smoke and cinders from freight train traffic and puffing river boats . . . smog-laden, moist fogs which hang along the river banks throughout the fall and winter months.

Yes, it's been a tough test. Yet today this fence is still in excellent condition, with no evidence of *rust!* This Copperweld Wire, made by Copperweld's Molten-Welding Process, has withstood the ravages of this 23-year period with *no maintenance costs.*

Actually, this is just one of many installations where a Copperweld product has demonstrated its long life and permanent strength. We have constantly improved Copperweld products since 1927 and you can expect even greater serviceability today.

we've watched for 23 years!



Copperweld Costs Less because it Lasts Longer

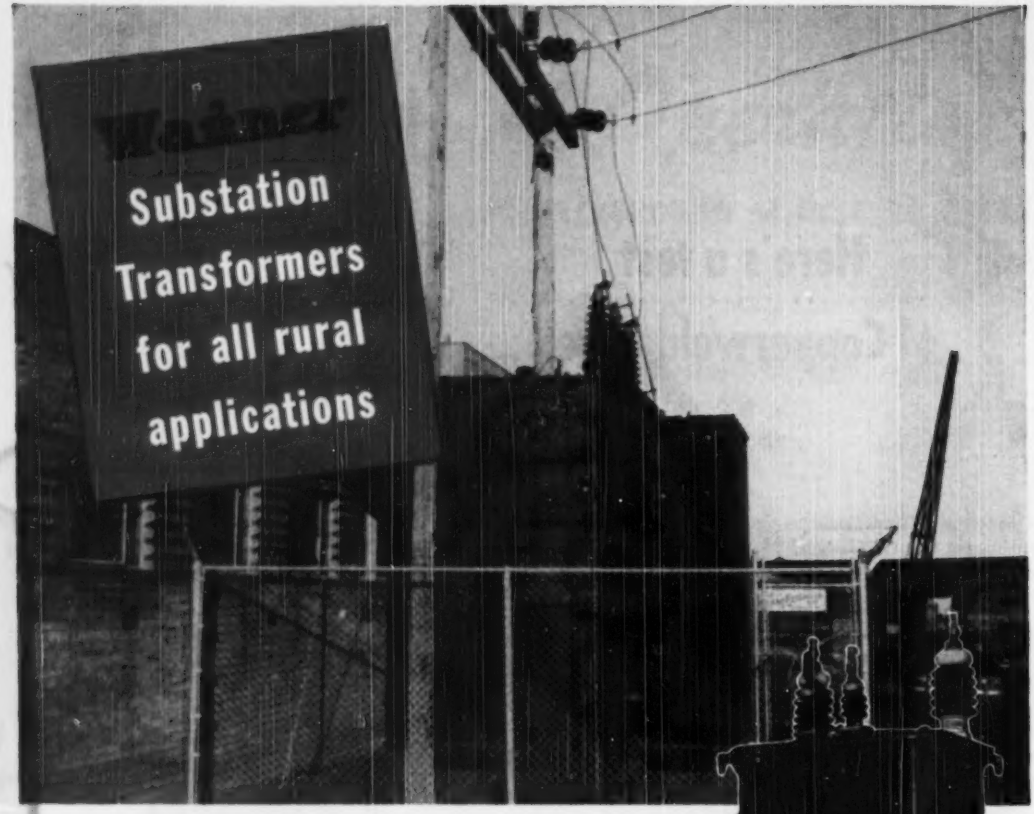
NON-RUSTING

Copperweld

TRADE MARK

• POWER CONDUCTORS • GUY & MESSENGER STRAND • OVERHEAD GROUND WIRE • GROUND RODS & CLAMPS • COUNTERPOISE WIRE • TELEPHONE LINE WIRE • TELEPHONE DROP WIRE • WEATHERPROOF WIRE • SIGNAL LINE WIRE • SIGNAL BONDS • INSULATOR TIES • NAILS & STAPLES • FENCE & BARBED WIRE

COPPERWELD STEEL COMPANY
Glassport, Pa.
SALES OFFICES IN PRINCIPAL CITIES



Wagner Transformers are the first choice of numerous rural line systems throughout the country. Power transformers for generating plants, substation transformers for feeding rural distribution lines, and thousands of pole type transformers along the lines all uphold the Wagner reputation for long life and trouble-free performance—a reputation backed by service records from the field and by six decades of transformer manufacturing experience.

* * *

The photograph above shows a 7500 kva type HPW three-phase Wagner Power Transformer in the substation of the Minnkota Power Cooperative, a generating co-op that furnishes power to ten distribution co-ops.

At right is pictured a typical 333 kva, type HEL single-phase Wagner Substation Transformer . . . transformers like these are serving dependably on hundreds of rural line systems.

If you are planning increased system capacity investigate the advantages of Wagner Substation Transformers. They are available in all standard kva and voltage ratings with standard accessories.

Bulletins TU-180 and TU-181 give full information on Wagner Substation Transformers. Write for your copies.

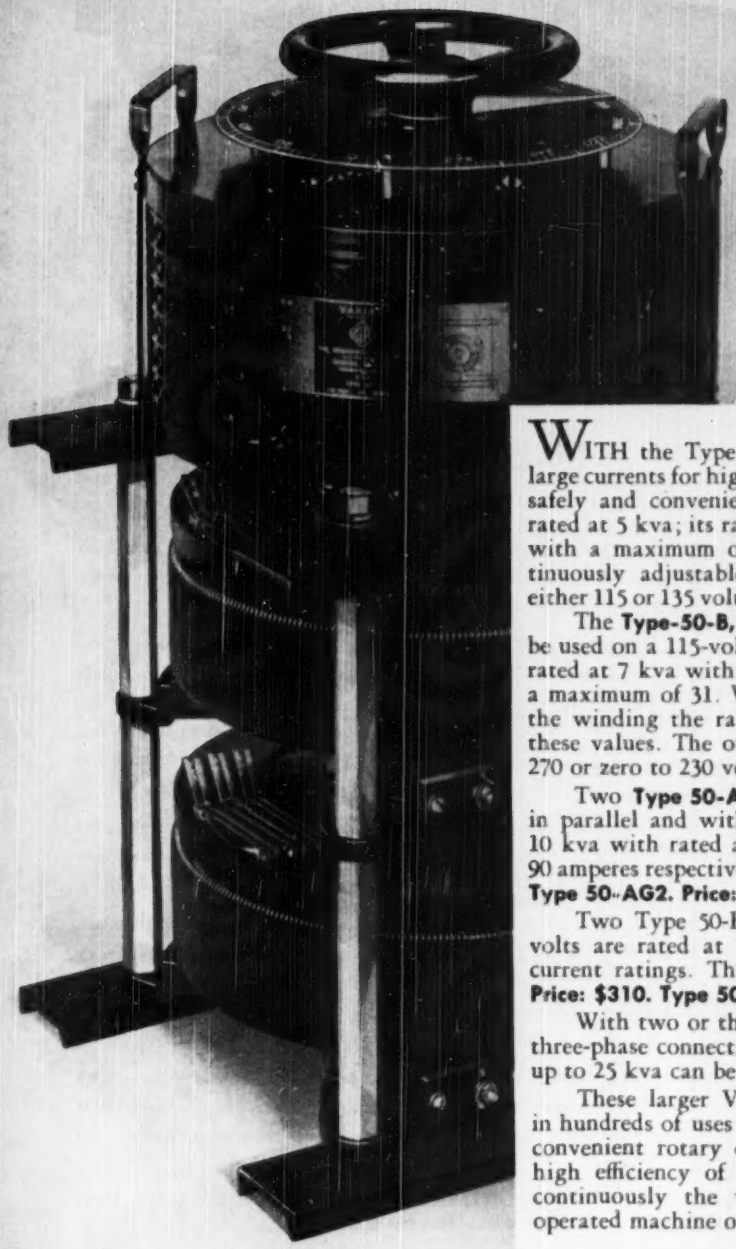
Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

VARIACS



for HIGH Power

WITH the Type 50-A or Type 50-B VARIAC quite large currents for high power operation can be handled safely and conveniently. The **Type 50-A** VARIAC is rated at 5 kva; its rated output current is 40 amperes, with a maximum of 45; its output voltage is continuously adjustable from zero to a maximum of either 115 or 135 volts from a 115-volt line. **Price: $140**

The **Type-50-B,** designed for 230-volt input, may be used on a 115-volt line. With 230 volts input it is rated at 7 kva with a rated current of 20 amperes and a maximum of 31. With 115 volts across one-half of the winding the ratings are reduced to one-half of these values. The output voltages are either zero to 270 or zero to 230 volts. **Price: $140**

Two **Type 50-A's** ganged, with their windings in parallel and with a suitable choke, are rated at 10 kva with rated and maximum currents of 80 and 90 amperes respectively. The ganged assembly is the **Type 50-AG2. Price: $310. Type 50-P1 Choke: $10**

Two Type 50-B's, when similarly used on 230 volts are rated at 14 kva with 40 and 62 ampere current ratings. This assembly is the **Type 50-BG2. Price: $310. Type 50-P1 Choke: $10**

With two or three Type 50 VARIACS a number of three-phase connections are possible. Various powers up to 25 kva can be handled.

These larger VARIACS are proving indispensable in hundreds of uses where the economical operation, convenient rotary control, excellent regulation and high efficiency of the VARIAC are desired to vary continuously the voltage on any high-power a-c operated machine or device.

MAY WE SEND YOU A COPY OF THE "VARIAC BULLETIN"?

GENERAL RADIO COMPANY Cambridge 39, Massachusetts

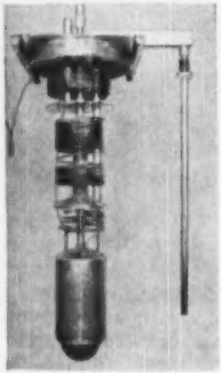
90 West St., New York 6 920 S. Michigan Ave., Chicago 5 1000 N. Seward St., Los Angeles 38

A new weapon to help you fight corrosion and corona cutting—

"326" MONEL-SHIELDED CABLE

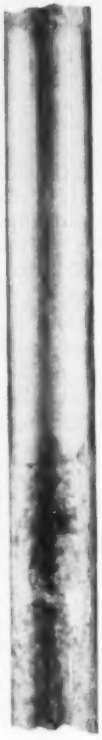
Tough Corrosion-resistant Non-magnetic

PROOF OF PERFORMANCE IN EXTREME CONDITIONS



STANDS UP TO TEMPERATURE EXTREMES! Monel is used for heat exchanger tubes at temperatures up to 900°F., and for helium liquefaction chambers where temperatures reach as low as 1° above absolute zero (−459.69°F.).

IN SEVERE ATMOSPHERIC CONDITIONS! One of 14,500 sockets exposed to New York City's corrosive industrial and harbor atmospheres. It is in the New York Times Building news bulletin sign. Monel is used for the screw shell, tongue, and connecting screw. 11,000 or three-fourths of all the Monel sockets needed no repairs after more than 11 years of service.



STANDS UP TO SALT WATER! Section of a Monel propeller shaft found by a lobster fisherman in Long Island Sound. Cleaning off the marine growths from years of submersion, he found the Monel shaft still smooth and uncorroded, with sharp, clean keyways and threads.

If corrosive, destructive conditions are keeping your cable costs high, new "326"® Monel-Shielded Cable may be the means to important savings for you.

"326" Monel Shielding is non-magnetic. In all other aspects, it corresponds to Monel, being highly corrosion-resistant, and unusually resistant to fatigue failure due to flexing and stress . . . qualities that make it an ideal cable shielding material for almost any application. Being non-magnetic, "326" Monel Shielding is extremely effective in reducing corona damage in high tension cables.

And the best news of all—when you ask your regular cable supplier for prices, you will find "326" Monel-Shielded Cable costs no more than you have been paying for comparable cable with less durable shielding.

Because of its high resistance to corrosion and its small diameter, "326" Monel-Shielded Cable is particularly suitable for applications where space is limited and where maintenance would be costly . . . mines, tunnels, underground and submarine conduits, ships, oil wells, chemical processing installations.

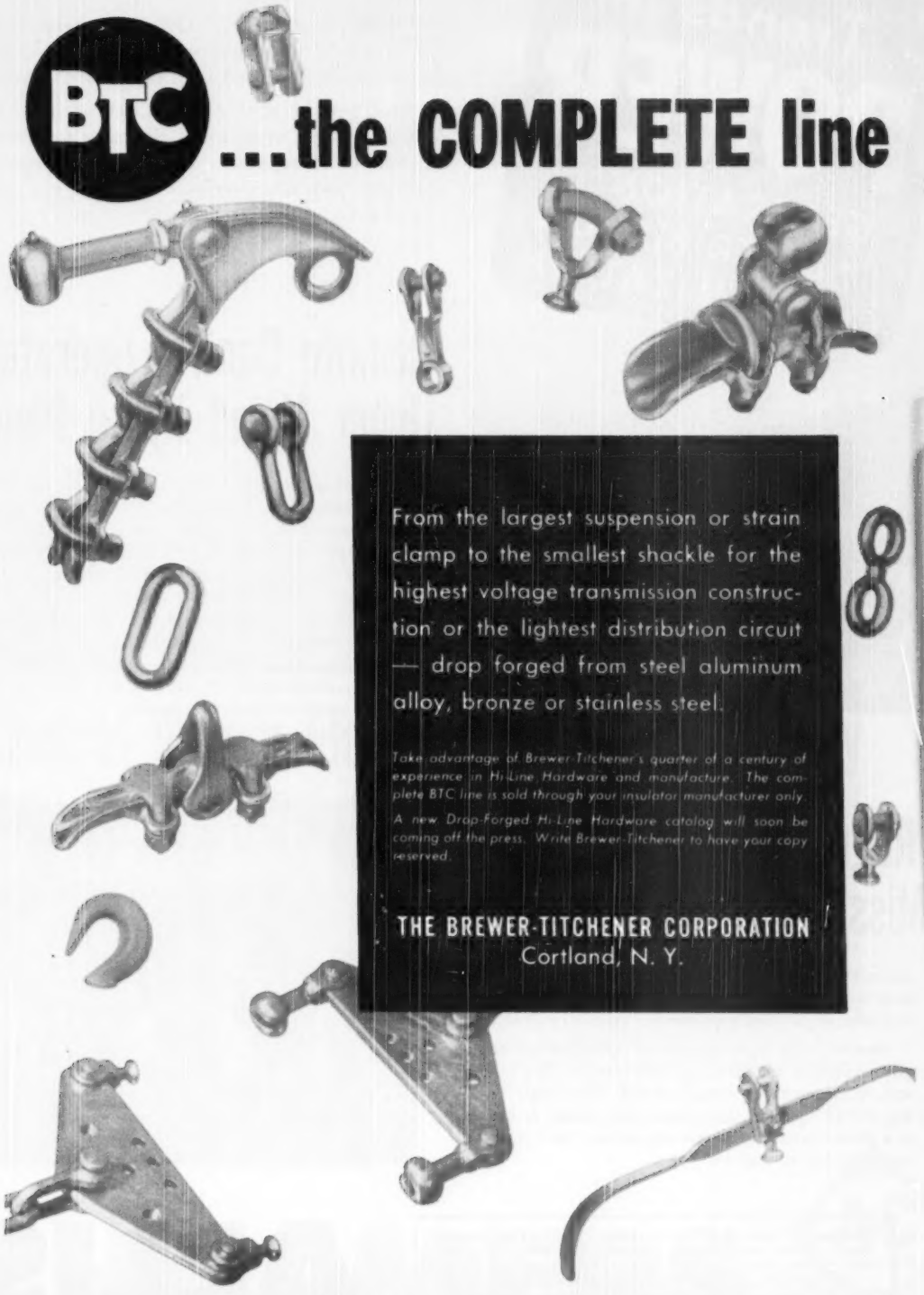
Most manufacturers of high-voltage cable can now supply you with "326" Monel-Shielded Cable. Take the first step towards lower cable maintenance costs by consulting your regular cable supplier now.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

EMBLEM OF SERVICE
NICKEL INCO ALLOYS

MONEL® • "K"® MONEL • "R"® MONEL • "KR"® MONEL
NICKEL • "D"® NICKEL • "L"® NICKEL • INCONEL®
DURANICKEL® • PERMANICKEL® • INCONEL "X"®.

BTC ...the COMPLETE line



From the largest suspension or strain clamp to the smallest shackle for the highest voltage transmission construction or the lightest distribution circuit — drop forged from steel aluminum alloy, bronze or stainless steel.

Take advantage of Brewer-Titchener's quarter of a century of experience in Hi-Line Hardware and manufacture. The complete BTC line is sold through your insulator manufacturer only.

A new Drop-Forged Hi-Line Hardware catalog will soon be coming off the press. Write Brewer-Titchener to have your copy reserved.

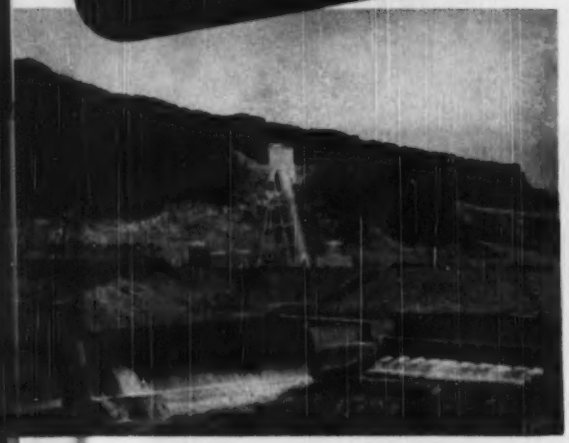
THE BREWER-TITCHENER CORPORATION
Cortland, N. Y.

Trends in POWER

• GENERATION
• DISTRIBUTION
• UTILIZATION

HERE ARE THREE Allis-Chalmers answers to demands for efficient and economical equipment in the face of rising fuel, labor and construction costs.

They are typical of Allis-Chalmers advanced designs employed in *all* major apparatus for electric power. It will pay you to call our nearby representative and have him show you why "A-C is a good name to know in electric power."



Remote Control Operates Upper Malad Hydro Plant

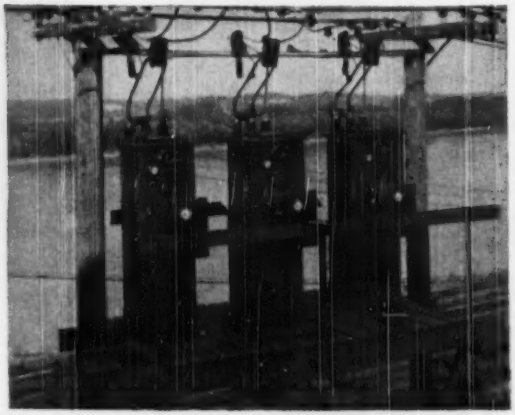
The unusual outdoor type hydro-electric plant of the Idaho Power Company on the Upper Malad River, shown at left, is entirely controlled from the recently completed Lower Salmon plant, three miles away. Telemetered indications at the Lower Salmon plant keep operating personnel informed at all times on operating conditions at the Malad plant.

Major Allis-Chalmers equipment for the Upper Malad plant includes a 12,000 hp, 124 ft head, 225 rpm vertical riveted plate steel spiral casing hydraulic turbine; and a modified umbrella type generator rated 7200 kw, 8400 kva, 6900 volts. In addition, a transformer and unit substation were furnished.

Regulators Do 3 Jobs for Missouri Power & Light Co.

Correcting voltage conditions, increasing revenue, and holding close voltage control are jobs assigned these Allis-Chalmers ⅝% step, single phase regulators.

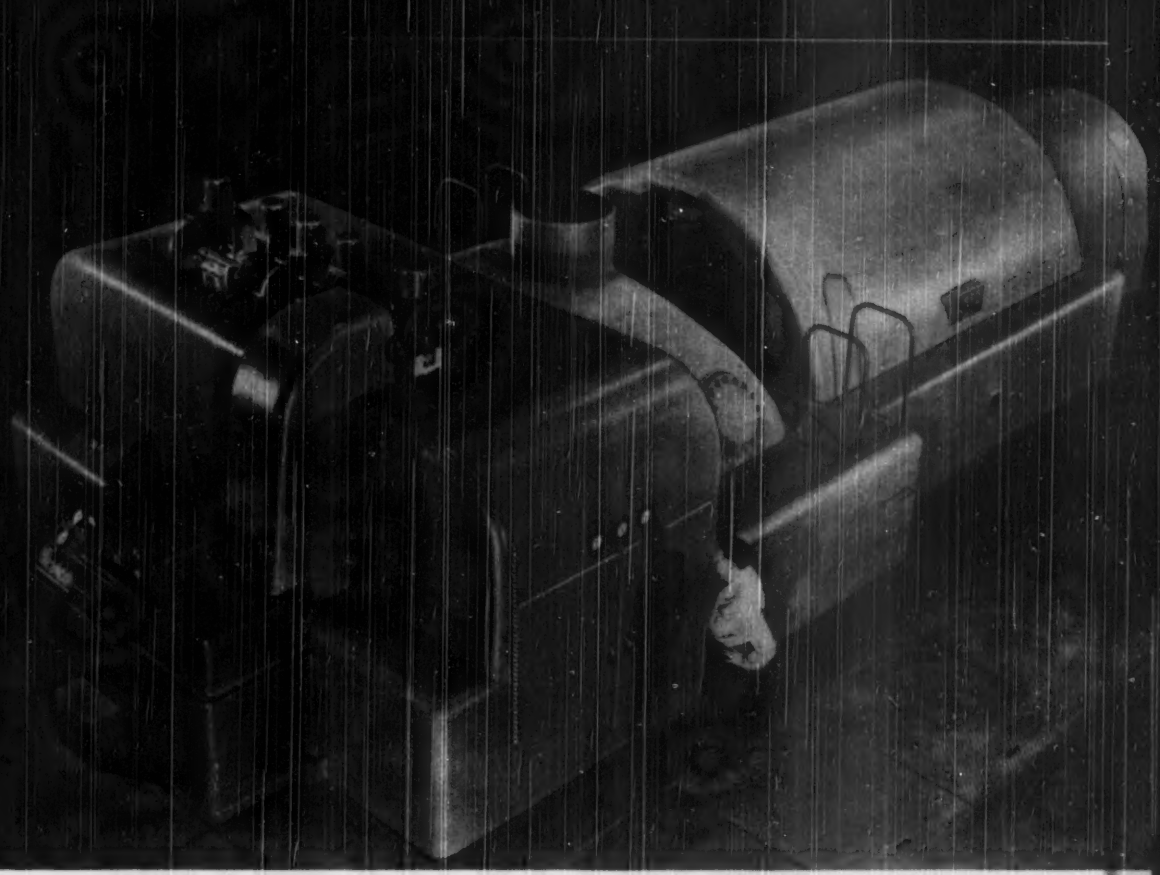
However, these regulators like all Allis-Chalmers single phase regulators, are delivering added benefits. They require only ⅓ the excitation current of any other single phase station type regulator. In addition, they operate as quietly as a transformer of the same rating, making them ideal for use in residential areas too.



Equipment for Power: Water Conditioning equipment, chemicals and service... Steam and Hydraulic Turbines... Generators... Condensers . . . Steam Jet Air Ejectors . . . Power Plant Pumps and Motors . . . Transformers . . . Circuit Breakers . . . Switchboards and Control . . . Switchgear . . . Unit Substations . . . Utilization equipment.

ALLIS-

Pioneers in Power and



Central Illinois Electric and Gas Company Places Third "A-C" Turbine in Operation

More power for Rockford, Ill. industries and homes is assured by this new Allis-Chalmers 20,000-kw unit in the new Sabrooke station of Central Illinois Electric and Gas Company. This installation like two other A-C 20,000-kw units in Rockford's downtown Fordam station is served by Allis-Chalmers condensers and pumps.

The new unit is designed to conform to AIEE-ASME preferred standards for 20,000-kw capacity. Standard design features of the Allis-Chalmers line incorporated in the new unit include:

centralized control system; accessibly enclosed auxiliaries and piping; simplified foundation requirements; a hydrogen cooling system of unmatched simplicity for the generator; ample enclosed space around the exciter as provided by "walk-in" exciter housing.

In addition, all control valves are integral with top half of high pressure casing, and have external connections to nozzles in lower half.

This turbine-generator unit is the product of a broad engineering program by Allis-Chalmers for the design of high pressure, high temperature steam turbines and hydrogen cooled generators. A-3049

ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.

CHALMERS

Electrical Equipment From Generation Through Utilization

A-C ALLIS-CHALMERS

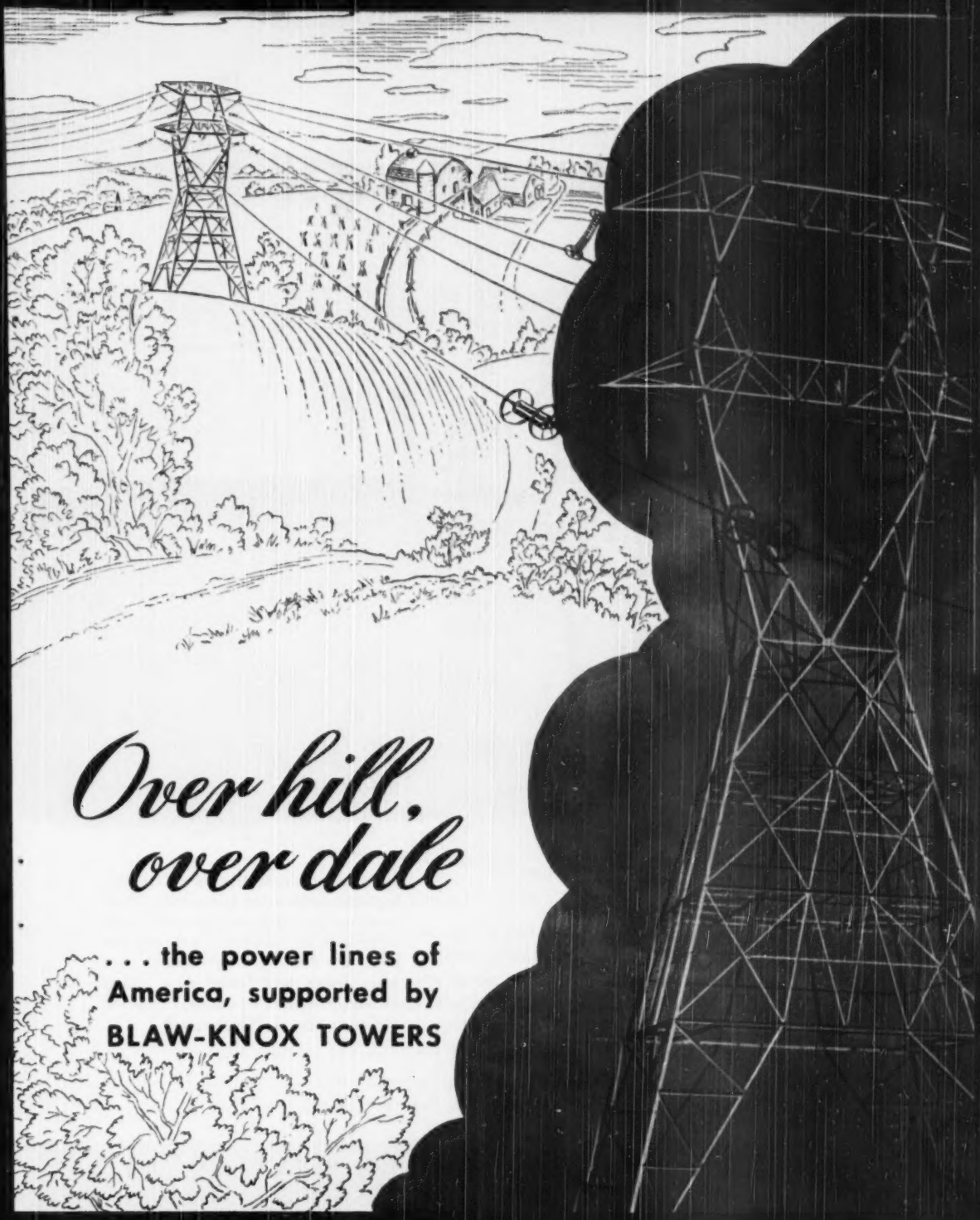
Next month!

Revolutionary development that will

ROCK the INDUSTRY

FEDERAL NOARK

Federal Electric Products Company, 50 Paris Street, Newark 5, N. J.



Over hill, over dale

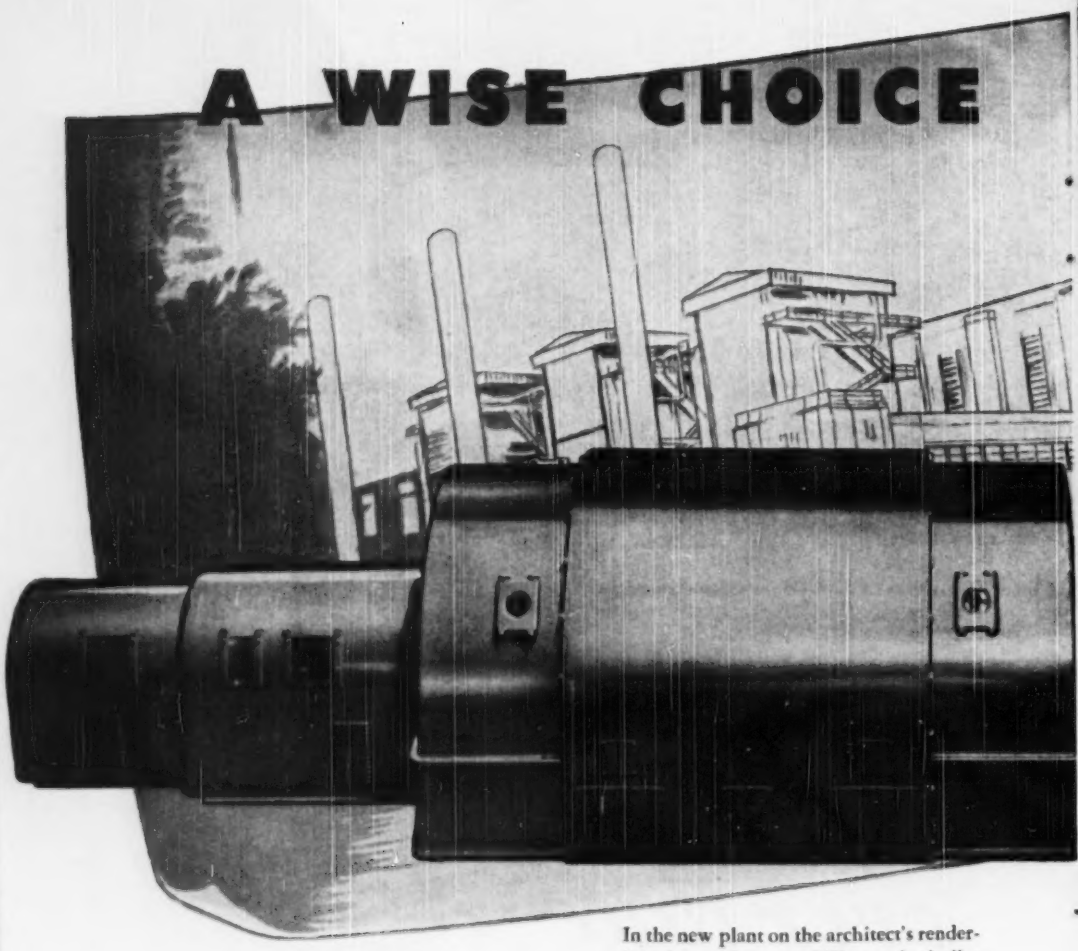
. . . the power lines of America, supported by **BLAW-KNOX TOWERS**

BLAW-KNOX TRANSMISSION TOWERS

BLAW-KNOX DIVISION OF BLAW-KNOX COMPANY • 2057 FARMERS BANK BLDG., PITTSBURGH, PA.

NEW YORK CHICAGO PHILADELPHIA BIRMINGHAM WASHINGTON

A WISE CHOICE



In the new plant on the architect's rendering shown above, an Elliott unit similar to the one pictured is now in service, with a duplicate unit on order. On the opposite page, the drawing shows another new plant which will house three Elliott turbine-generators — one of 11,500 kw, the other two of 7500 kw each.

ELLIOTT COMPANY

STEAM TURBINE DEPT.
JEANNETTE, PA.
Plants at: JEANNETTE, PA. • RIDGWAY, PA.
AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.
DISTRICT OFFICES IN PRINCIPAL CITIES

for these fine new plants-

TURBINE-GENERATORS

by ELLIOTT

YOU'LL find them in quite a few of the new medium-sized power generating plants—these sturdy, dependable Elliott turbine-generators.

The unit shown above, rated 11,500 kw, is typical of those which are selected for these stations. Its streamlined design and many superior features of construction in both driver and driven elements express the latest in modern engineering thought. Its reliability is a positive factor assuring not only satisfactory performance, but also a sound basis for close accuracy in the calculation of operating costs.

A new station gets off on the right foot for a long and successful career, when Elliott turbine-generators are selected as its basic equipment.

11-727

STEAM TURBINES • GAS TURBINES • GENERATORS • MOTORS • CONDENSERS
FEEDWATER HEATERS AND DEAERATORS • STEAM JET EJECTORS
CENTRIFUGAL BLOWERS • TURBOCHARGERS FOR DIESEL ENGINES
TUBE CLEANERS • STRAINERS • EXPANDERS • FILTERS

WILL THIS COAL FEED THE WRONG KIND OF FIRE?

THOSE giant coal piles that stand next to power plants present little fire hazard in themselves. But when industry feeds its coal into pulverizing machinery to make a faster-burning, more efficient fuel, then sends it through ducts connecting pulverizers to storage bins—the picture changes! The fine coal particles ignite easily, burn fiercely—and flames inside the duct are almost impossible to get at.

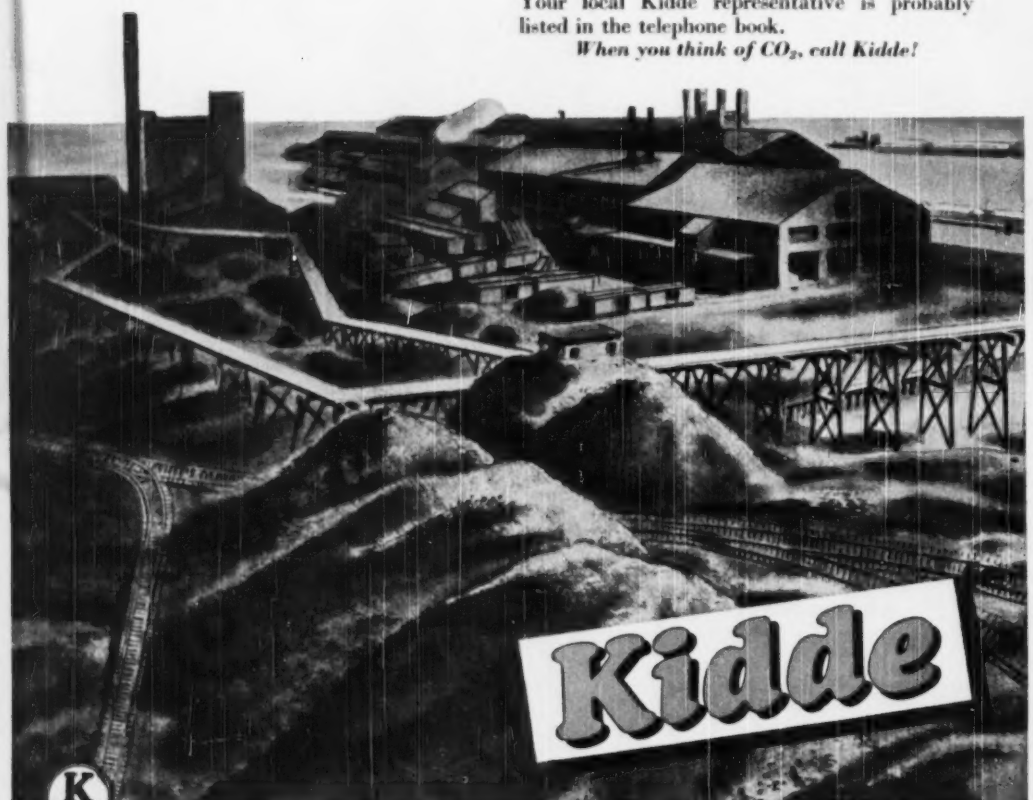
That hazard is taken care of in a mighty effective way at the East River Plant of Consolidated Edison Company of New York—by a *Kidde* automatic extinguishing system.

If a fire breaks out in the duct, the system goes into action fast. Pressure trips operate to close the duct dampers . . . flame-smothering carbon dioxide (CO_2) pours through *Kidde* Nozzles directly into the duct. The flames are out in a few seconds—*and the unburned coal stays dry, clean, ready for use.*

It's in cases like this—where hazards are toughest—that Kidde skill counts *most*. It will pay *you* to bring your fire-protection problems to us.

Your local Kidde representative is probably listed in the telephone book.

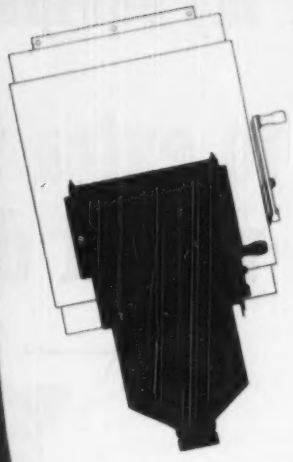
When you think of CO_2, call Kidde!



Walter Kidde & Company, Inc., 530 Main Street, Belleville 9, N. J.

In Canada: Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

AN IDEAL APPLICATION



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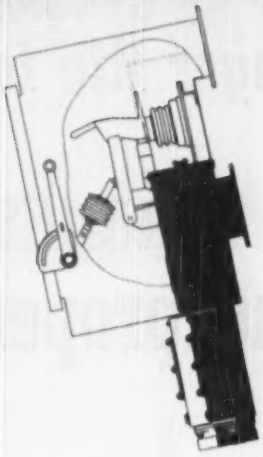


SIDE

Diagram shows space saved by superimposing a three pole, single throw, 400 ampere, 5000 volt Air Interrupter Cable ISOLATOR, with throat for transformer mounting, over equivalent air interrupter switch. Ratio is approximately 4 to 1 in favor of ISOLATOR.

YOU CAN DO IT BETTER WITH AN AIR INTERRUPTER ISOLATOR

1. The Air Interrupter ISOLATOR is horizontal mounted, occupying only one-fourth of the space required for other types of interrupting equipment.
2. Air Interrupter ISOLATORS are lighter, consequently they can be handled more easily by construction crews.
3. The interrupter assembly is of the modern slip type and there are no main contact bearings nor external arcing during interruption.
4. The interrupter units can be removed for inspection by means of a hot stick without clearing the circuit.
5. The unit is surprisingly low in cost.

Why pay higher and more expensive equipment for this job?

Write for Bulletin No. 138 and new price list

THREE E — ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILLINOIS

"I get jobs thru on schedule and longer life for my equipment dollar . . .

thanks to extra traction and proper weight distribution"

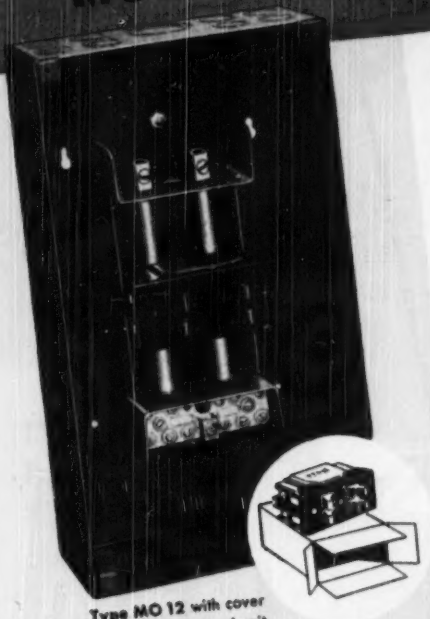
Sure, you want jobs rushed thru on schedule! But as a cost-conscious executive, you also want speed *without wasteful use of equipment capital.* And that's exactly why FWD is first choice—wherever conventional trucks have roughest going and shortest life. The FWD principle of driving power on each wheel gives you many unmatched advantages. Extra traction rolls the FWD safely and swiftly over terrain that challenges ordinary vehicles. Balanced distribution of load and power minimizes strain and wear. Maintenance and "down-time" are slashed . . . creating more *productive time* and more *productive dollars* for you!

GET FULL FACTS on 38 standardized FWD motorized units. Each combines truck and equipment into one complete, easy-to-buy package — matched to your particular needs. One central responsibility for all equipment. See Graybar or write FWD direct.

THE FOUR WHEEL DRIVE AUTO CO.
Clintonville, Wisconsin • Canadian Factory: Kitchener, Ont.
World-Wide Sales and Service

Built by the Makers of America's Foremost Heavy-Duty Trucks

NOW... "plug-in" type MULTI-BREAKER LOAD CENTERS



Type MO 12 with cover removed and additional unit ready for installation.

ADD CIRCUITS EASILY, QUICKLY

Start with 4... Add More

TYPE MO 12 consists of box with bus structure and one 4-circuit "plug-in" unit in place. One or two additional 2 or 4 circuit units can be plugged on the bus structure —giving 6, 8, 10 or 12 circuits as required.

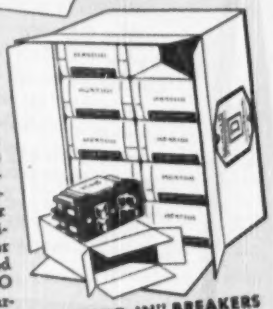
TYPE MO 20 is similar to type MO 12 but it provides space for as many as four additional 2 or 4 circuit "plug-in" units—giving 6, 8, 10, 12, 14, 16, 18 or 20 circuits as required.

SMALL STOCK OF COMPONENT PARTS

COVERS ALL JOB REQUIREMENTS

BOX WITH BASIC BLOCK

FLUSH OR SURFACE TRIM



"PLUG-IN" BREAKERS

Plug-in Units available in ratings of 15, 20, 30, 40 and 50 amperes, 120/240 volts A.C. Handle ties permit converting adjacent poles of similar capacity on each breaker unit into double-pole, individual trip circuits. Breaker units identical with those used in NMO Panelette and NMO Panelboard. 3φ, 4 wire arrangement is also available.

Coilless

THERMAL-MAGNETIC BREAKER UNITS GIVE 2-WAY PROTECTION

Thermal element responds to heating effects of both load current and surrounding atmosphere. *Total temperature* is limited to a safe value. **Magnetic** element responds instantly to heavy overloads or shorts. Damage is minimized.

***Both* ELEMENTS ARE NEEDED FOR *Complete* PROTECTION!**

***Write* for Bulletin SA 590... it gives the complete story. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.**

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Want to carry power vertically?

CHASE SQUARE COPPER TUBE BUS CONDUCTOR
is the way to handle it

THE SQUARE SHAPE of Chase Copper Tube Bus Conductors means more rigid construction . . . higher mechanical strength to resist the stresses of short circuits. With four flat sides, and a large cross-sectional area, they can be securely anchored to the floor, assembly is easier . . . efficient and economical connections can be made to power-and-light panels. And – there is no danger of insulation moving downward, to leave thinly protected sections.

IN ADDITION to having excellent current-carrying capacities and extreme resistance to corrosion, Chase Square Copper Bus Conductors require only one tube per phase . . . minimize "skin effect" . . . can be arranged in triangle-formation, resulting in equal spacing and equal voltage between phase conductors.

• *For complete information about these stronger, better Bus Conductors, write to Dept. EW-550, Chase Brass & Copper Co., today!*

Chase

the Nation's Headquarters for
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VL and NHC Series

LEADER VL-440 SPECIFICATIONS

Housing, channel and deep drawn end caps of 20 gauge steel, finished in white, high-gloss baked enamel. Extruded tubular side panels and moulded one-piece louver is of glowing white plastic that is warp-proof, colorfast, and destaticized. Louver swings down for easy servicing. Choice of 31° or 45° shielding. May be used as single units or in continuous runs—suspended or ceiling mounted. VL Series uses 2, 3 or 4 40-watt 48" T-12 lamps. Wired units include UL and ETL approved sockets, type FS easily replaceable starters and two high p.f. 2-lamp ballasts. Conventional 110-125 volts, 60 cycle A.C. Other voltages on request. NHC Series available for use with Slimline tubes and for 120, 200, 300 or 425 milliampere operation in lengths from 48" to 96".

You'll find this attractive fixture installed in the most tastefully decorated offices, stores and office buildings. The "Officer" not only adds to any decorative effect, but helps sell goods and services through appealing highlighting of floors, furniture and display sales material. The LEADER "Officer" is rich in construction, too. For example, it is provided with the famous LEADER one-piece louver of destaticized plastic . . . a louver with a multitude of small, rigid apertures—made possible by one-piece molding—to provide excellent shielding and soft, gracious light-diffusion.

Sold and installed only by the better electrical wholesalers and contractors

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NE 35	14 Sol.	8 Str.
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NE 100	2 Str.	1/0
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- **Positive Grip Action**—Screw pressure on contact pad perfects pressure contact—is self-locking—increases "pull out" resistance.
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Facts for the Co-ops

As a group, American farmers enjoy a reputation for being able to protect their own interests. They are especially suspicious of any something-for-nothing business deal. That's why there's a growing belief that some Oklahoma, Arkansas, and Missouri farmers have not been given all the facts about the latest deal public ownership enthusiasts have cooked up for them.

The public ownership boys say the farmers are completely in favor of the proposed contracts between the Southwestern Power Administration and groups of the area's rural electric cooperatives. They also say it is a very good deal for the farmers. And, to date, none of the farmers involved has seriously challenged either of those statements.

Yet, there are lots of "bugs" from the viewpoint of the farm co-ops in their arrangement with SPA. First, even if they are not technically illegal, the agreements are based on obviously shaky moral foundations.

The deal calls for groups of co-ops to borrow Rural Electrification Administration funds for construction of steam generating plants and extensive transmission systems. The co-ops then will lease the bulk of these facilities to SPA, which also gets an option to buy them. Promoters of this scheme insist that Congress never has refused SPA funds to build precisely these facilities. The fact is that Congress definitely and flatly refused to give SPA any funds for steam plants or for similar, if not exactly identical, transmission lines.

Congress has voted billions to help farmers obtain central station electric service. But the taxpayers have a legitimate protest when co-ops use the low-cost federal money made available to them to put another federal agency into a business from which it had been specifically barred by Congress.

But there are even more obvious drawbacks for the co-ops. True, under contracts for power with SPA the latter agency will lease the co-op facilities at rentals sufficient to pay off the REA loans in 35 years. But the co-ops—not SPA—will be in debt and tied to the federal government for that long period even though they pay off loans on their distribution systems sooner.

The contracts also knit the co-ops to SPA as their major, if not sole, source of power supply for 40 years. And they must buy power at SPA's going rates—not at a fixed charge. SPA rates may be attractive today. But they are fixed to pay out the power investments at only two hydro plants from which SPA now sells power. Additional and much more expensive plants soon will be producing power for SPA. And that agency may have to increase its rates—as Bonneville Power Administration is talking of doing in order to pay out the power costs of expensive new plants in the Northwest.

In that event, where can the co-ops go if they do not like the new rates? Not to their state utility commissions which have no jurisdiction over federal power. Nor to the Federal Power Commission which can only approve—not reduce—SPA rates under existing law.

The co-ops also become political attachments of SPA in its hectic battle to spread public power in the Southwest. This is, to say the least, ironical for organizations which long have insisted they are units of free, private enterprise.

Dissolve American Power & Light

WHEN American Power & Light Co stockholder H. Lane Ogle filed his dissolution plan for that company (EW, May 1, p 6) he made some very pertinent claims. One significant statement was to the effect that after the recent sale of the common stock of Pacific Power & Light Co, it became obvious that there was no need for a holding company sitting astride Washington Water Power Co because it performed no useful or economic function. He stated further that "American unduly complicates the capital structure of which it is a part and impairs the advantages of localized management, efficient operation, and effectiveness of regulation."

We are of the firm opinion that these claims made by Ogle are entirely valid. We can see no reason why American Power & Light Co should be allowed to continue to exist with no significant holdings except the Washington Water Power Co. (The other subsidiaries are Portland Gas & Coke Co and Washington Irrigation & Development Co.)

If this view is correct, SEC should take appropriate action on the Ogle plan without further delay. The Commission's primary responsibility under the Holding Company Act of 1935 is to safeguard the interests of the security holders and customers of the companies under its jurisdiction. Its apparent dismissal of the Ogle plan, without even a cursory investigation of the serious complaints lodged therein, evades the spirit, if not the letter, of the Act.

Under the circumstances, the very minimum to be expected of SEC—which seldom before has shown reluctance to speed up dissolutions—is that it make a serious study of Ogle's claims and give all legitimately interested parties a chance to express their views.

Looking back a few weeks to the sale of Pacific Power & Light Co, we remember that certain statements were made to the effect that it was difficult for investor-owned power companies to continue to operate in the Pacific Northwest. But, as the record unfolds, we find the Pacific Co doing very well under private management. It was originally proposed to sell Pacific at a price of $10 million plus certain added amounts to a group planning to transfer the property to public power agencies. Now the property is earning at the rate of almost $2.3 million per year which would seem to indicate a common stock value of not less than $20 million. Even after statements questioning the ability of private power to succeed in this area the Pacific Co sold bonds to yield 2.93%, a very low rate for most utilities.

As long as American Power & Light Co holds 99.9% of the stock of the Washington Water Power Co, it might be very easy to sell out to public power agencies in the Northwest. In fact, that is a great danger in the present situation. We cannot be sure that this is not the ultimate plan; so we see this additional reason for speedy action in the dissolution and transfer of Washington Water Power stock to the stockholders of American.

If the management and stockholders of American should be so shortsighted as to be willing to sell out to public power with the hope of gaining a few extra dollars, they need only look at the Pacific Power & Light deal. Here the company would have gone to the public power proponents at a much lower price than its present apparent worth. The stockholders and the American people have gained by its retention in private hands.

We believe that American Power & Light Co should be dissolved and the stock of Washington Water Power distributed to its stockholders to keep one more company secure in the hands of the American public.

The Electrical Week

Another merger of two utilities in one state has made South Carolina Electric & Gas Co and South Carolina Power Co one. The new company will operate under the former name with S. C. McMeekin remaining as president. E. L. Godshalk, president of the Power Co, will be executive vice president of the merged companies (p 72) . . . The UWUA-CIO at its national convention went on record as being opposed to federal encroachment in the electric utility industry (p 75) . . . The results of the bargaining elections at Westinghouse which found IUE-CIO and UE-ex-CIO breaking about even will make the coming elections at General Electric most important to both unions (p 76) . . . If SEC has no objections, Cities Service Co will offer its holdings in Toledo Edison to Cities' stockholders. The Ohio utility would then become an independent operating company (p 77) . . . SEC has announced that the dissolution plan filed by a stockholder of American Power & Light Co to force it to get rid of Washington Water Power Co isn't actually a plan but only a "statement filed in the form of a plan." SEC proposes to do nothing about it (p 77) . . . And now is a good time to take a look at the output chart which shows that output is holding up exceedingly well for this time of year (p 79).

• • •

Trackless trolley service continues to improve generating plant loading at Boston. On April 22 the Metropolitan Transit Authority replaced gas bus operation with trolley coaches on the crosstown line between Harvard Square, Cambridge, and Massachusetts Station, Boston, via Harvard Bridge.

Harvard University has decided to charge dormitory students from $1.50 to $4.50 per year for the use in their rooms of certain electric appliances, excluding radios and phonographs. This tax is intended as a safety measure, and the revenue is to be allocated toward providing adequate wiring in such buildings. Irons, toasters, and percolators will be taxed $1.50 each; hot plates, electric blankets, and heaters $2.80 each; and refrigerators up to $4.50.

The high cost of plant construction is leading northern utilities to consider more seriously the semi-outdoor plant. One utility in the Midwest, where weather once was deemed too severe for such plants, may soon have one in the planning stage.

Boston Edison is telling its stockholders that in 1949 it had to earn $4.51 per share in order to pay its $2.50 dividend. The difference, $1.71, went to pay federal income tax on the company's earnings.

Electric utility companies are becoming close rivals of Chambers of Commerce as home town boosters. An examination of nationally circulated magazines and metropolitan newspapers will reveal a surprising number of electric companies advertising the opportunities offered by their areas.

Call it bragging but in 1949 ELECTRICAL WORLD with 3,439 pages ranked twelfth among all magazines in number of pages of advertising carried. Only two general circulation magazines carried more: The Saturday Evening Post in sixth place with 4,121 pages and Life in tenth place with 3,547 pages.

Officials of the Cleveland municipal power plant are jubilant. In 1949 for the first time in 35 years they succeeded in buying coal at a lower price than Cleveland Electric Illuminating Co. Both agree that CEI lost out because its greater demands forced the utility to buy coal on contract. The municipal was able to wait for periodic price drops.

The Senate Finance Committee won't go along with the House-approved increase in the federal social security payroll tax. The committee is expected to vote to retain present rates for another year or so.

Sales of Allen B. Du Mont Laboratories, Inc, have jumped from $70 in 1931 to $45,154,470 in 1949. The company manufacturers television receivers and tubes.

Soon only 26 farms in Connecticut Light & Power Co's territory will be without available electric service. Farms served will total 14,626.

Notes From The News

Los Angeles engineers are completing the task of moving three 40-ton houses from a 1,100-ft gorge to a site five miles away. The houses are being moved to make room for a new power plant of the Los Angeles Department of Water & Power. The moving bill comes to $12,000 . . . Warren, Ky., Rural Electric Cooperative Corp's right to borrow up to $10 million from the Rural Electrification Administration for extending and improving its service has been upheld by the State Court of Appeals.

South Carolina Power Firms Merge

Electric & Gas Co Absorbs Power Co Despite Opposition of Public Power Groups; McMeekin Retains Presidency with Godshalk Now Vice President

ANOTHER ROUND in South Carolina's public-private power fight ended late last month with final merger of South Carolina Power Co, Charleston, into South Carolina Electric & Gas Co, Columbia.

The combination creates an enlarged Electric & Gas with total assets of close to $100 million and consolidated 1949 electric operating revenues of more than $16 million. Opposed by South Carolina Public Service Authority (Santee-Cooper) and some of the state's rural electric cooperatives, the merger finally won regulatory commission approval in March.

Unable to Block Loan

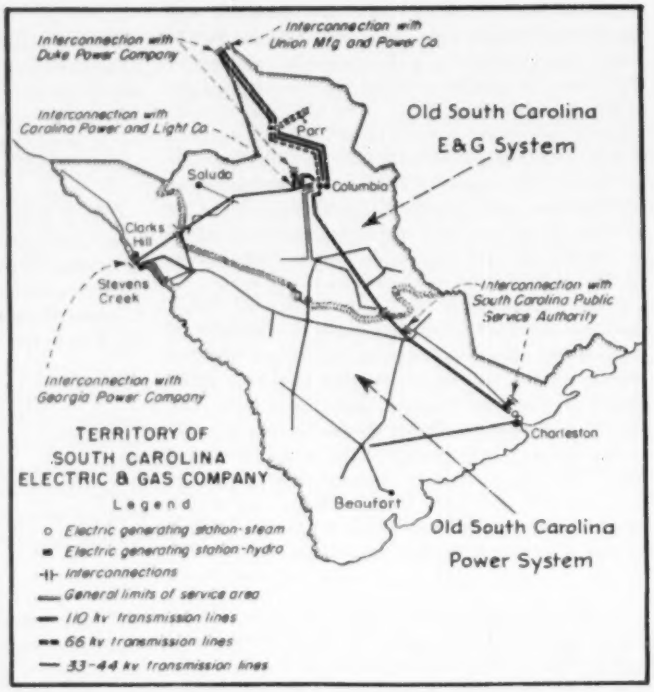
On another public power front the company has been less successful. Last year Electric & Gas, Power Co, and Carolina Power & Light Co fought a losing action against a $7,590,500 REA loan to a new 14-member super-coop for construction of transmission lines to cooperatives now served primarily by the privately owned utilities. They sought an injunction on the ground that the proposed lines would duplicate existing facilities.

This action was dismissed by South Carolina's Supreme Court last August. As a result, says Electric & Gas, the company "will probably lose its rural cooperative customers." Co-ops, however, provide less than 1% of the company's total revenues.

Godshalk Will Be VP

S. C. McMeekin, president of E&G, will continue as president of the consolidated system. E. L. Godshalk, who has been president of Power Co, will be executive vice president. Other SCP officers given posts in the merged company include Homer M. Pace and T. A. Busby as vice presidents; H. A. Petit, assistant treasurer; and Bonnie Huff, assistant secretary.

At their May 17 meeting stockholders will be asked to approve an increase in the number of directors from 9 to 17 so that all service areas will be represented on the board. Their authorization also will be sought for a proposed issue of 60,000 shares of $50-par 5% preferred stock to raise funds to reimburse construction cost requirements. If this stock is issued, the company will eliminate 21,032 shares of 5% preferred and 80,858 shares of 5½% preferred.



The company also plans to redeem $22.2 million of 3⅝% first mortgage bonds on May 25, with the funds to be made available by sale of new 3% bonds. All property will be brought under one mortgage, which will facilitate future financing and the carrying out of a four-year $33-million expansion program.

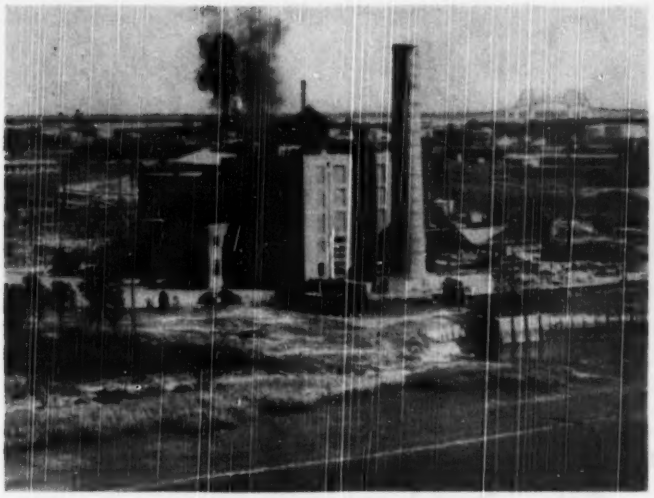
Electric & Gas was formed in 1924 under the name of Broad River Power Co. Its name was changed to South Carolina Electric & Gas Co in 1937. In 1948 it bought South Carolina Power Co, which had been organized in 1928 by consolidation of a former SCP, Edisto Public Service Co, Augusta-Aiken Railway & Electric Corp, and Georgia-Carolina Power Co. The price paid to Commonwealth & Southern Corp for SCP was $10.2 million in cash.

About 80% of the consolidated company's gross operating revenues comes from sale of electric energy. It also produces and sells manufactured gas in parts of Charleston and Columbia and the surrounding area and operates some 214 miles of bus routes there.

The company serves 292 communities in a 14,400-sq-mile area in 23 counties of central, southern, and southwestern South Carolina. Estimated population is 750,000. The two largest cities are Charleston, about 155,000 in population, and Columbia, about 115,000. Power is sold to four municipalities, co-ops, the Charleston naval base, and under contract to Duke Power Co and Carolina P&L.

Average number of Power Co electric customers in 1949 was 63,518, of which 52,021 were residential and 11,278 commercial. The average residential customer used 2,510 kwhr in 1949 and paid $63. Average revenue per kwhr to the company was 2.51¢. Sales totaled $488,874.

Total sales of electric energy by Electric & Gas in 1949 amounted to $671,467. Average number of electric



HAGOOD STEAM plant of South Carolina Electric & Gas Co, located just north of Charleston city limits, has a major part in company's expansion program. A 22,500-kw addition is to be completed this year and a 40,000-kw unit in 1951. Present capability is 25,000 kw

customers was 46,391, of which 38,579 were residential and 7,181 commercial. Average bill per customer for the year was $57 for 1,994 kwhr. Average revenue per kwhr was 2.86¢.

The consolidated company has seven principal plants, six in South Carolina and the Stevens Creek hydro plant on the Savannah River in Georgia. They include three steam plants, Parr, with an effective capability of 80,000 kw; Hagood near Charleston, 25,000 kw; and Charlotte Street in Charleston, 16,500 kw; and four hydro plants, Saluda, 136,000 kw; Parr Shoals, 10,000 kw; Columbia, 6,000 kw; and Stevens Creek, 9,000 kw. It owns 1,255 pole miles of transmission lines, 4,709 pole miles of distribution lines, and 200 substations.

Major construction planned for the period ending Dec 31, 1953, involves a 22,500-kw and a 40,000-kw unit at the Hagood steam plant with an additional generator there planned for 1953. Additional capacity can be made available through Electric & Gas's nine interconnections with non-affiliated power and manufacturing companies. All of E&G's own facilities are interconnected.

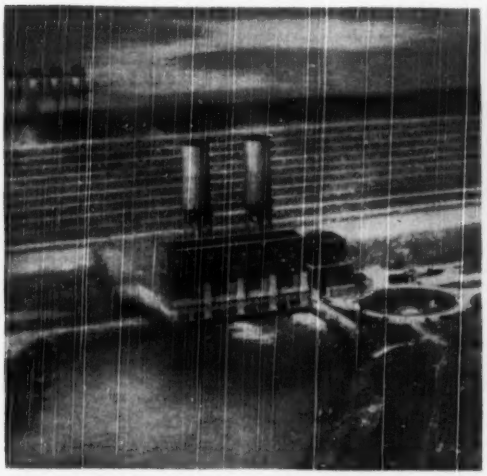
Roanoke Rapids Hearing Will Reopen on June 15

Hearings before the Federal Power Commission on the hotly contested hydroelectric development at Roanoke Rapids will be reopened June 15 for new evidence relating to the Department of Interior's recently created Southeastern Power Administration.

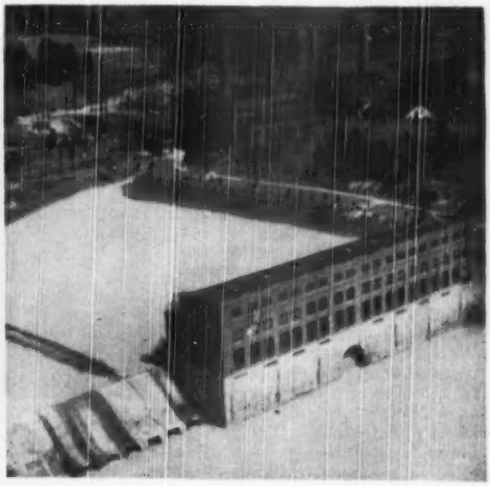
Only evidence which could not have been presented at the original hearings last year will be received, FPC ordered April 27. Other Interior motions to present additional evidence and to require a different presentation of the presiding examiner's opinion in the case were denied (EW, April 10, p 81).

Interior and the Virginia REA Association oppose the application of the Virginia Electric & Power Co for an FPC license to develop the site on the Roanoke River near the Virginia-North Carolina state line. FPC's chief presiding examiner, Frank A. Hampton, recommended commission approval of the Vepco application March 20 (EW, March 27, p 76).

Each party will have two weeks after the close of the reopened hearing to file a supplementary brief on the new evidence presented. After the briefs are filed, the examiner will either rule that his opinion stands or issue a supplement or modification of it on the basis of the additional hearing, the FPC order stated. Following the examiner's action, all parties will have 20 days to file exceptions. Deadline for filing exceptions had previously been extended only to June 5.



LARGEST HYDRO plant on Electric & Gas system is Saluda station in Lexington County, 14-mi west of Columbia. Capacity is 130,000 kw



COMPANY has two plants at Parr in Fairfield County, S. C., 14,800-kw Parr Shoals hydro (shown above) and a 72,500-kw steam station

CHAIRMEN of Northwest Electric Light and Power Association committees include A. I. Sawyer, left, Idaho Power Co, transmission and distribution; J. D. Ellis, Pacific Power & Light Co, power production; and C. E. Cannon, Washington Water Power Co, electrical equipment. In right panel are J. H. Steede, British Columbia Electric Railway Co; R. C. Setterstrom, Montana Power Co; and Ralph Guse, Washington Water Power Co, members respectively of the arrangements, utilization, and code committees of the association

Northwest Power Group Discusses Substation Noise, Other Problems

SUCH KNOTTY PROBLEMS as unit substation noise, electric space heating, and contracting line construction were discussed at the annual meeting of the Engineering and Operation Section of the Northwest Electric Light and Power Association in Vancouver, B. C., April 26-28.

Five important points to be considered by the utility with a noise problem in a residential unit substation were suggested by Corbett McLean, Pacific Power & Light Co. He advocated that:

1. The manufacturers be pressed for more uniform assembly, with noise an important factor of design.

2. The cost of a quieter unit be compared with cost of a sound-proofing enclosure.

3. Enough property be purchased for an installation to place the transformer at least 100 ft from the nearest dwelling.

4. If an enclosure is indicated, that available material be selected with lowest sound transmission and highest sound absorption properties.

5. The transformer be energized at least two weeks before the structure is completed so the reduction in noise level will be obvious to the neighborhood.

He reported that his company had eliminated noise complaints on a 15,000-kva sub with a $6,800 building of pumice blocks filled with dry sand, covered with a tile roof.

Definite correlation between load carried by the Northwest Power Pool and daily temperatures in the area were reported by W. J. Mosley, of the pool. Records of the past season showed that energy load increased about 11.8 Mw per deg drop of temperature, taken at 4 pm and weighted on the basis of area portion of total pool load and area annual mean temperature. Accurate temperature forecasts, he said, would be very valuable in predicting loads for pool operation. Both energy and peak loads on the Northwest pool are expected to increase about 7% through the winter of 1950-51.

That engineering and economic problems of serving space-heating load, which has contributed materially to this growth, are inseparable was the opinion of George Pike, Washington Water Power Co. The problem is complicated by the few special cases where combination of favorable circumstances produces economical installations. These cases, he said, cast doubt in the customers' mind when the utility tries to lay the facts of electric space heating before him in their true light.

JOHN BANKUS, left, chairman of the Engineering and Operation Section of the Northwest Electric Light and Power Association, poses with T. Ingledow, B. C. Electric Railway Co, who made arrangements for the association's Vancouver meeting

Enthusiastic acceptance by employees and unions of a comprehensive three-year program to train apprentice linemen was reported by Glen George, Washington Water Power. Trainees attend classes on theory and practice one Saturday each month on their own time and complete homework assignments each week. Classes are conducted in cooperation with the union, a local trade school, and the Federal Apprentice Training Service.

Experience with contracting line construction in the West has been both good and bad, and a panel discussion under C. L. Brown, Pacific Power & Light, found it generally unfavorable except under special conditions. Best experience resulted from lump sum contracts on new transmission line construction or new distribution circuit construction, especially where it would be necessary to pay utility crews per diem living expenses. A competent contractor can save the utility overhead, investment in equipment, and idle time of crews between jobs. Balancing these advantages is the need for more supervision, plus poor public relations and strained relations with utility crews working in the same general area.

High quality and excellent reliability of microwave channels (approaching 100% with standby power supply) qualify microwaves for nearly all future utility problems of transmitting intelligence, reported W. H. Blankmeyer, Montana Power Co. Costs of providing intelligence channels vary from $60 per year per channel mile for leased wire down to $1.50 for multichannel microwave, he said.

UWUA Records Its Opposition to Federal Power Encroachment

THE UTILITY Workers Union of America, CIO, has nailed down its opposition to encroachment by the federal government in the electric utility industry.

Possibly because of the advocacy of some federal power projects by other CIO unions, UWUA previously has softpedalled its views on this subject, even though some of its locals have not. But at the union's national convention in New York, April 28-30, it placed itself squarely on record against federal or any other kind of government power operations.

Resolution Adopted

Some 400 convention delegates unanimously approved a six-point resolution designed to set UWUA policy on public power. It asserted:

"Where power is generated in conjunction with worthwhile water projects, the transmission, distribution and sale of such energy should, under proper regulation, be allocated to the private utility companies. Where investor-owned companies fail to provide for the distribution and sale of electrical energy then, and then only, should the government undertake such duties.

"Approximately one fifth of the power generated in America today is distributed and sold by government agencies. We believe that further encroachment of government into the utility industry should be discouraged except in cases of national emergency.

"It is our firm belief that the best interests of all of the people of this nation can best be served and secured through collective bargaining in investor-owned public utility corporations.

Hit Water Project Misuse

"We shall continue to advocate that the water resources of the nation be developed. However, we shall object to any move that will result in these worthy projects being used as a means of destroying taxpaying utility companies who, under proper regulation, are furnishing adequate service.

"We further recommend as a matter of policy that the national officers, the local officers and members use every means available to prevent further nationalization of the utility industry.

"We further recommend as a matter of policy that we insist on fair and proper regulation of the utility industry and that every effort be made to compel utility managements to fulfill their obligations to the consumers and to their employees."

The resolution was prepared by a committee headed by Andrew J. McMahon, president of UWUA's New York City Local 1-2. Joseph A. Fisher, national president of UWUA, said it had the full support of all UWUA officers.

In an explanatory statement, the drafting committee predicted the resolution might be viewed "askance" in some quarters because it put the union on the same side of the public power situation with the investor-owned power companies. But "despite the possible implication," the group asserted this position "is, in the final analysis, in the best interests of our country, our membership and future generations."

The committee scored the theories of "some leaders of the CIO" who advocate such federal organizations as power authorities. Despite the contentions of such leaders that power authorities could improve living conditions in certain areas, the committee held that "even if electricity were furnished free" living standards would remain low until "the economic conditions of workers" of the area had been improved.

The group further charged that "job security, promotional opportunity, and working conditions" often become "tools and plums" of politicians under public ownership of utilities.

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Board OK's Franchise

A 10-year franchise granted by Franklin, Tenn., to the Franklin Power & Light Co has been approved by the State Railroad and Public Utilities Commission. The franchise goes into effect after the expiration of the present franchise Aug 4, 1959.

String Ties Up System

A piece of tinsel string on a boy's kite caused damage of more than $1,000 and left 35,000 residences of East St. Louis, Ill., in the dark for about eight hours.

The string became entangled in a high-voltage electric line, knocked out a main power line to a substation, short-circuited a 33-kv transmission line, and disabled the town's fire alarm system in four districts.

Seattle Seeking to Buy Only Transmission Lines

Any purchase of Puget Sound Power & Light Co properties by the City of Seattle would involve only distribution facilities in the Seattle competitive area. This was decided by representatives of both at their first conference on the proposed purchase.

The city has declined to compete with PUD's for the Rock Island and White River generating plants and regards the Snoqualmie plant as too old.

In lieu of the power supply that would be furnished by taking over the company's generating plants, it was decided to negotiate on the company's offer to furnish power for an iterim period.

The company offered to furnish 83,500 kw of power from the date of acquisition by the city to March, 1952, when City Light hopes to be able to take over the entire load. It now has agreed to extend its offer from March, 1952, for one year if the city should find that it needed the additional time to prepare for the load.

The company agreed that in general only the electrical operating properties will be included in the purchase negotiations. The company's headquarters building and certain non-operating properties will not be considered. When the time comes for consideration of this phase of the negotiations, the company will furnish an inventory.

City Light will determine the number of the company's personnel that will be taken over by the city, the negotiators agreed.

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2 PUD's in Washington Grant Wage Increases

The Chelan and Douglas County PUD's of eastern Washington have reached agreements with Local 77, International Brotherhood of Electrical Workers, AFL, which provide for wage increases. Linemen in Chelan County will get a boost of 8¢ an hour, in neighboring Douglas County 5¢ an hour more. Both contracts provide for eight paid holidays with at least seven a year being guaranteed. The guarantee works when the holidays fall on Saturdays.

Workers are given ten working days' vacation a year during the first five years of employment, with an additional working day of vacation for each additional year of employment, up to 15 days. The limit for accumulating sick leave has been increased from 65 to 90 days.

Control of Industry by UE or IUE Now Depends on Coming GE Voting

THE BARGAINING ELECTION at General Electric's 57 plants on May 25 looms more important in the interunion struggle for bargaining control in the electrical industry as a result of last week's close vote in 40 Westinghouse plants.

If either of the two contending unions—the left-wing United Electrical, Radio & Machine Workers (ex-CIO) or the new International Union of Electrical, Radio & Machine Workers (CIO)—is to dominate the industry it will have to win a smashing victory at GE. Otherwise, the union with the most membership will be confronted with a large and effective minority which will put collective bargaining in the industry on a highly competitive basis.

The National Labor Relations Board will conduct 122 elections in GE's 57 plants located in 52 cities. More than 100,000 employees will vote, the biggest plum being the 16,700 employees in Schenectady. At the atomic energy plants operated by GE at Schenectady, the union will have to meet the Atomic Energy Commission's security requirements before it can be certified. This probably would bar the UE, since GE has long been under orders of AEC not to bargain with the UE.

To Vote by Units

As in the General Motors and Westinghouse elections, the poll will be plant by plant and by units within plants so that these and other unions are likely to win parts of GE. The big question is how much. The other unions number nine—crafts, engineers, and technical employees.

The CIO union won the right to represent twice as many Westinghouse employees as the UE, but the largest union—East Pittsburgh's 12,000 employees—remains in doubt. IUE-CIO has a 100-vote edge, 5,763 to 5,663, but it is 36 votes short of a majority. The result can be decided either way, by what happens to 147 challenged ballots. If a run-off is necessary, the 170 "no union" votes will be the controlling factor.

Other Run-offs Needed

Other run-offs are necessary among engineers and production workers in Jersey City and among pattern makers at East Pittsburgh.

The UE won more plants than the CIO, but they were smaller. In fact, omitting the run-offs, it will represent fewer workers than actually voted for the left-wing union, while the CIO will represent more than the votes it got. That is because each plant is decided by majority vote, and some votes were closer than others.

Nineteen units with 27,840 employees voted CIO, while 21 units with 14,900 workers voted UE. In total votes, however, the CIO got 27,281 and the UE, 22,820.

Four small units voted for other unions and three for no union.

On the whole, the CIO is running ahead of the UE in the industry's elections but not by too comfortable a margin. And there are still other elections pending.

MAIMED in construction accident, George Earl, apprentice lineman for Union Power Construction Co, is lowered from a pole in downtown Denver. Earl came in contact with a 4-kv conductor. Both hands and part of his right forearm were burned off. He died several days later in a hospital

Water Supply Forecast Same in 11 West States

The 1950 water supply picture in the 11 Western states will be pretty much a repeat performance of last year's conditions, the Soil Conservation Service's analyses of April snow surveys indicate.

Plenty of water—maybe too much—was forecast for the Northwest, adequate supplies in the Intermountain states, too little in the Rio Grande Valley and Arizona.

While April storms may change the situation, especially in the Cascades and Sierra, April forecasts have proved reasonably accurate, and the snow surveyors do not expect any important variation in the over-all runoff.

Floods may occur again in the Northwest. Conditions in the Kootenai and Flathead drainages are such that if cold weather and normal precipitation occur during the next several weeks, damaging high water along the main Columbia River will occur. If normal melting conditions prevail throughout the basin, the southern streams will peak before the northern ones reach a high stage, and little high water damage would occur on the lower Columbia. However, if the present heavy snow pack should melt uniformly over the basin, causing its rivers to peak simultaneously, damaging high water should be expected along the main stem.

Arizona, New Mexico, and southern Nevada will be hard-pressed for water, especially toward the end of the irrigation season, the surveys indicate. Utah and Colorado prospects are better. The slopes east of the Rockies may expect a liberal supply.

Poultry Production Gets Boost from Power Firm

Mississippi Power & Light Co is sponsoring a series of meetings in key localities designed to stimulate poultry production and provide additional cash income for state farmers.

The program, being carried out by the utility's agricultural and industrial development department, emphasizes the fact that every town and community has a potentially profitable industry right in its own back yard, and seeks to encourage increased poultry production through modern scientific methods.

Details of the program will be presented to civic groups, organized agricultural agencies, and individual farmers by power company agricultural engineers in a series of meetings at strategic localities in the company's 44-county territory.

Yields—Operating Electric Utility Securities

Date or Period	Bonds			Preferred Stocks			Common Stock		
	1st Quality	2nd Quality	3rd Quality	1st Quality	2nd Quality	3rd Quality	1st Quality	2nd Quality	3rd Quality
1950									
Apr. 27	2.61%	2.63%	2.79%	3.77%	4.09%	4.36%	5.23%	5.94%	6.70%
Apr. 20	2.60	2.62	2.71	3.78	4.00	4.36	5.21	5.91	6.72
1949									
Apr. 25	2.71	2.78	2.92	4.04	4.33	4.70	5.75	6.58	7.90
Apr. 18	2.71	2.78	2.92	4.02	4.30	4.68	5.71	6.52	7.82
END OF LAST FOUR QUARTERS									
1st 1950	2.59	2.61	2.71	3.78	4.01	4.36	5.22	5.85	6.67
4th 1949	2.59	2.61	2.72	3.85	4.06	4.46	5.37	6.15	7.01
3rd 1949	2.61	2.65	2.77	3.88	4.15	4.54	5.55	6.47	7.51
2nd 1949	2.69	2.75	2.88	3.98	4.26	4.66	5.94	6.96	8.14

Data: Reis & Chandler, Inc.

Toledo Edison Sale Would Put Cities Service Near End of Its Divestment

ONE OF THE LAST and richest of Cities Service Co's once extensive electric utility holdings is expected to be on its own soon.

Securities and Exchange Commission has given interested persons until May 8 to request a hearing on the holding company's proposal to offer its interest in Toledo Edison Co for subscription by its own common stockholders. If no objections are raised, speedy approval is likely for the sale, which will practically complete Cities Service's compliance with the Public Utility Holding Company Act of 1935.

Present management of Toledo Edison is considered almost certain to remain in control under the plan now before SEC, since the major Cities Service stockholders are expected to retain large blocks of the operating company's stock. Toledo's city government is interested in continuance of local management since it recently granted the company a new 10-year franchise. The company's board of directors has been increased from 11 to 15 members in a move apparently intended to bring onto the board more men from the Toledo area.

After consummation of a proposed reclassification of Toledo Edison's common Cities Service will own 3,703,410.12 shares of the new common. It proposes to offer 3,702,000 shares to its stockholders on the basis of one share of Toledo Edison stock for each share of Cities Service common owned. Cities Service held about 98½% of the 2,775,000 shares of Toledo Edison common outstanding before the reclassification began. The increase in shares, recently approved by Toledo Edison shareholders, is backed by that company's operating surplus.

The transaction will involve about $60 million. Stockholders will be offered shares at a discount from the expected market price of Toledo Edison, about $16 a share.

Unsubscribed shares will be sold by Cities Service through ordinary brokerage channels. After completion of the rights offering, Toledo Edison proposes to issue and sell for its own account an additional 400,000 shares of common stock at competitive bidding. Proceeds will be applied to construction.

It is through the offering of these 400,000 shares that a Toledo syndicate hopes to gain control of Toledo Edison.

Officials of Toledo Edison are now presenting a road show to acquaint security dealers in the major cities with the company in preparation for the day when its stock will be listed on the exchanges. The program opened in Boston last week, and showings in New York, Philadelphia, Pittsburgh, Cleveland, Toledo, Chicago, Los Angeles, and San Francisco were scheduled.

Toledo Edison serves all or parts of the eight counties in the northwest corner of Ohio, including Toledo and other industrial centers. Currently it has 154,511 customers in a 2,500-sq-mi area. Gross revenue increased from $23.8 million in 1948 to $24.7 million in 1949, while cost of production, distribution, and transmission was reduced from $10.4 million in 1948 to $8.5 million in 1949 through use of newly installed generating equipment and other economies. At the end of 1949 earned surplus stood at $5,409,516, or up about $3 million from 1948. Assets totaled $103.8 million, including plant valued at $94.5 million.

Toledo Edison is the last of Cities Service's major utility subsidiaries. At the time of its registration under the Holding Company Act in 1941 Cities Service was the top holding company in a system containing 125 companies, of which 49 were electric and gas utilities, with consolidated assets of approximately a billion dollars. Ordered to limit its operations, Cities Service elected to dispose of its utility interests and now has almost completed this divestment. Late last year it sold Ohio Public Service Co to Ohio Edison Co.

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SEC Won't Act on Plan to Dissolve American P&L

There will be no formal action by the Securities and Exchange Commission on the dissolution plan for American Power & Light Co filed last week by a stockholder. (EW, May 1, p 6.)

SEC holds that the proposal of the stockholder, H. Lange Ogle, cannot be classified as a formal plan. It is merely "a statement filed in the form of a plan," SEC officials declared.

Ogle made his filing under section 11(d) of the Holding Company Act, but SEC said that it has not invoked 11(d) in the case of American. For provisions of the section relating to stockholder dissolution plans to become effective, SEC explains that it would have to go to the courts. No court action is presently contemplated by SEC to speed dissolution of American, and the holding company is considered to be proceeding to comply with the law.

Thus, the Ogle statement has not been given the status of a formal plan and no action will be ordered.

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Florida Power Ordered to Cut Rates by $500,000

Florida Power Corp has been ordered by the Pinellas County Utility Board to reduce rates in the county by $500,000 a year.

The order, which applies to residential, commercial, and industrial rates, becomes effective within 30 days barring a court injunction. Utility officials said they would ask for the injunction.

The order followed a three-week hearing at which Florida Power had requested a 7½% rate increase, which would have added about $365,000 a year to its revenues. The reduction was based on the findings of the engineering firm of Burns & McDonnell, Kansas City.

A. W. Higgins, Florida Power president, called the action "political." The company said the rate base used in computing the new rate schedule was

about $10 million less than the true value of the property serving the county. The reduction would cut net earnings by about $300,000 annually.

Constitutionality of the board, believed to be the only county utility regulatory body in the country, has just been upheld by the state supreme court and the United States Appellate Court in New Orleans.

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Eastern Utilities Elects to Continue in Existence

Trustees of Eastern Utilities Associates, Boston holding company, have voted to continue the enterprise by forming a new Massachusetts corporation to own and operate Brockton Edison Co, Fall River Electric Light Co, and Montaup Electric Co and to own all the securities of Blackstone Valley Gas & Electric Co.

Recently the Securities and Exchange Commission ordered the company to dissolve. However the ruling specified that if Eastern should eliminate 10% of the outside holdings in Fall River and Montaup within a year it might reclassify its stock and continue in existence.

To meet the commission's requirement, the trustees have agreed to buy New England Electric System's holdings of Fall River stock at $65 a share, and they intend to make an offer on a similar basis to the remaining stockholders. The purchase will be financed by a one-year loan. These actions must be approved by SEC.

Under the plan now favored by the trustees Eastern will dispose of the gas properties owned by Blackstone Valley. Proceedings under the Holding Company Act have been pending since 1947.

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Canadian L&P Winds Up; $5 a Share Equity Left

Final distribution of assets of Canadian Light & Power Co, now being wound up, awaits settlement with federal and provincial tax authorities, Pres James Wilson said in the company's annual report.

Remaining equity of common shareholders as of Dec 31 totaled $172,155, or approximately $5.17 a share. An interim distribution of $20 a share was made last October.

The company, which has been supplying light and power to Montreal and adjacent counties, sold its generating station at St. Timothee and other physical assets to the Quebec Hydro-Electric Power Commission last June. The price received was sufficient to pay off the utility's outstanding 5% first mortgage bonds amounting to $2,519,700 at maturity on July 1, 1949.

RECENT RATE CHANGES

Central Lincoln Peoples Utility District, Newport, Ore., has announced a rate reduction of $99,000 for residential, commercial, and industrial customers. The cut will become effective a month after Bonneville Power Authority connects with the PUD system at Reedsport, scheduled for Oct 1. Power bills will be reduced 10.7% on the average. Residential customers now paying $6 a month or more will save $13.44 annually, and industrial consumers now paying at least $25.50 monthly will save $28.44 a year. The reduction is contingent on voter authorization of a $1-million revenue bond issue in the May 19 primary election.

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City in Texas Told to Honor Utility's County Franchise

Cities cannot throw out electric utilities holding franchises from the county, at least for ten years, the Court of Civil Appeals held here April 12.

It set aside a ruling by District Judge Thomas C. Ferguson which had upheld the City of Mason's effort to make West Texas Utilities Co move its power lines.

The decision marked the first test of a legislative act of 1949, aimed at protecting utilities from being removed by towns incorporated after the county commissioners granted franchises. Jasper and Hemstead both adopted removal ordinances.

Mason County officials granted a 50-year utility permit in 1925. Mason incorporated in 1945 and on March 9, 1949, adopted an ordinance to require removal of the electric lines from its streets and alleys.

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Merger of Ohio Edison, OPS Becomes Effective

Merger of Ohio Public Service Co into Ohio Edison Co became effective May 1, making the latter the largest electric operating utility in Ohio and twelfth in the nation in number of customers served.

More than 80% of Ohio Edison Co stockholders voted to approve the plan at a special meeting April 27. Earlier Public Service stockholders gave almost unanimous approval.

Walter H. Sammis, president of Ohio Edison, will continue to head the combined company. Three Public Service executives will fill key posts in the merged utility. R. E. Burger, OPS president and chairman of the board, will be chairman of the executive committee; J. A. Strozier, vice president, will retain his rank; and M. W. Thernes, vice president, secretary, and treasurer, will serve as treasurer.

The former Public Service properties will be operated as a division of Edison under Strozier. While headquarters will be in the Edison Building in Akron, OPS's offices in Cleveland also will be used indefinitely.

Ohio Edison plans to retire all OPS bonds and notes. It proposes to sell $58 million worth of 30-year first mortgage bonds and borrow about $7.5 million in short term bank loans. Money not needed for the retirement will be applied to payment of $380,000 of duplicate interest and expenses and to construction.

FINANCIAL BRIEFS

Ohio Power Co, Canton, has received SEC authorization to acquire from Public Service Co of Indiana for $294,000 in cash the 525 shares of outstanding common stock of Union City Electric Co. Ultimately Union City will be merged into Ohio Power.

Union Electric Co of Missouri has been authorized by SEC to sell an additional 350,000 shares of its no-par common stock to its parent, North American Co, for a cash consideration of $5 million. Proceeds would be applied to Union Electric's 1950 construction program.

Kansas City Power & Light Co will ask its stockholders at a special meeting early this month to consider increasing the authorized debt limit. If the increase is approved, the company plans to sell $15 million in bonds through competitive bidding. Proceeds will be used for construction.

Florida Power Co stockholders have approved changes in the employee retirement plan to provide additional benefits. Minimum eligibility age has been lowered from 30 to 25 years, which will allow 150 more employees to join; the company will bear the cost of prior service credits; minimum retirement allowance has been increased from $30 to $60 a month; and maximum allowance has been boosted from $500 to $750.

Monthly, Yearly Records Set by January Output

The steadily rising output by American electric utilities set more monthly and yearly records in January.

Energy production for the month totaled 26,871,302,000 kwhr, or 2.1% above the previous record of December, 1949. Output for the year ended Jan 31, 1950, was 292,333,409,000 kwhr, or 0.4% above the previous maximum set during the year ended Dec 31, 1949. The yearly production was 2.8% above that for the corresponding period ended Jan 31, 1949.

Water power plants produced a record 8,333,839,000 kwhr in January, an increase of 2.2% over the previous high set in April, 1949. As a percentage of January total production, hydro output increased from 30.4% last year to 31% this year. Fuel plants produced 18,537,463,000 kwhr during January.

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Company Adds 1,500 Kw

Willamette Lumber Co is installing a 1,500-kw steam turbine generator at its Foster, Ore., plant. The new generator will give the plant a total capacity of 4,000 kw. Of this total, the lumber firm will use only half for its own purposes and will sell 2,000 kw to the Mountain States Power Co, which operates in the area. The company uses mill waste as fuel.

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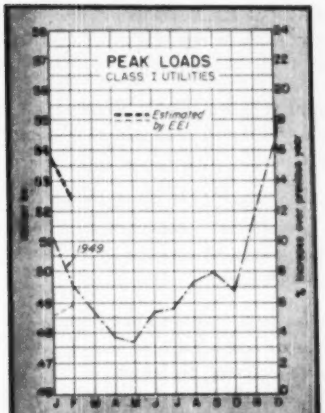
Union City Votes for TVA

Union City, Tenn., has voted 1235 to 87 to have TVA supply its electricity. Consumers, who have been getting electricity from a municipal plant, are expected to save $120,000 a year in the switchover.



MEETINGS

Southeastern Metermen's Association
With Annual Short Course on Electric Meters, University of Florida, Gainesville, May 8-12.

Public Information Program
Steering Committee, Sheraton Hotel, Chicago, May 10; National Meeting, Sheraton Hotel, Chicago, May 11.

Commercial and Industrial Electrical Exhibit
Sponsored by Electrical Manufacturer's Representatives Association of Michigan, Convention Hall, Detroit, Mich., May 10-12.

Public Utilities Advertising Association
Annual Convention, President Hotel, Kansas City, Mo., May 11-12.

Meter Engineers Committee of New York State
Special Meeting, Hotel Lexington, New York, N. Y., May 11-12.

Pennsylvania Electric Association
Prime Movers Committee, George Washington Hotel, Winchester, Va., May 11-12; Meter Committee, Hotel Bethlehem, Bethlehem, Pa., May 17-18; Systems Operation Committee, Spring Meeting, Skytop Lodge, Skytop, Pa., May 18-19; Transmission and Distribution Committee, Spring Meeting, Alexander Hotel, Hagerstown, Md., May 25-26; Joint Meeting, Traffic Safety Committee, May 26; Relay Committee, Castleton Hotel, New Castle, Pa., June 15-16; Electrical Equipment Committee, Abraham Lincoln Hotel, Reading, Pa., June 19-20.

American Institute of Electrical Engineers
Great Lakes District Meeting, Hotel Hayes, Jackson, Mich., May 11-12; Conference on Telemetering, Benjamin Franklin Hotel, Philadelphia, Pa., May 24-26; Summer General Meeting, Huntington Hotel, Pasadena, Calif., June 12-16.

New Jersey Utilities Association
Annual Spring Conference, Seaview Country Club, Absecon, N. J., May 12.

Northwest Electric Light & Power Association
Business Development Section, Annual Sales Conference, Finlen Hotel, Butte, Mont., May 15-17.

Missouri Valley Electric Association
Annual Meeting, President Hotel, Kansas City, Mo., May 16; Accounting Conference, President Hotel, Kansas City, Mo., May 18-19.

***Northwest Public Power Association**
Accounting Section, Winthrop Hotel, Tacoma, Wash., May 25-26.

Edison Electric Institute
Transmission and Distribution Committee, Cosmopolitan Hotel, Denver, Colo., May 25-26; Annual Convention, Auditorium, Atlantic City, N. J., June 5-7.

Pacific Coast Electrical Association
Annual Convention, Mapes Hotel, Reno, Nev., May 31-June 2.

National Association of Electrical Distributors
Annual Convention, Convention Hall, Atlantic City, N. J., June 12-16.

Canadian Electrical Association
Annual Convention, Manoir Richelieu, Murray Bay, Que., Canada, June 15-19.

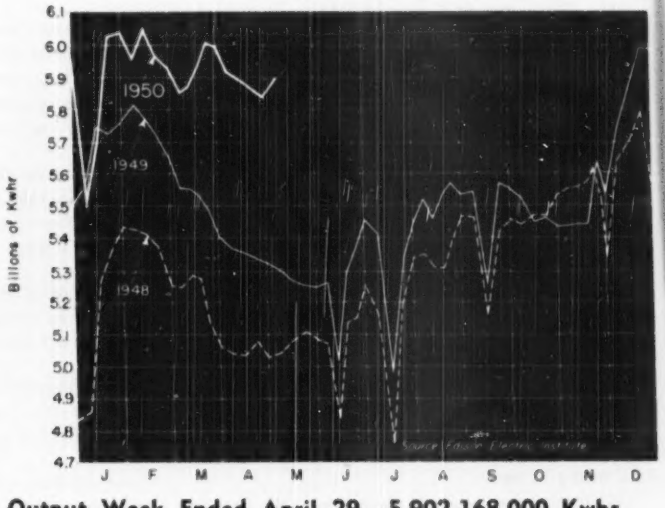
American Society of Mechanical Engineers
Semi-annual Meeting, Hotel Statler, St. Louis, Mo., June 19-23.

American Society for Testing Materials
Annual Meeting with Exhibit of Testing Apparatus and Related Equipment, Chalfonte-Haddon Hall, Atlantic City, N. J., June 26-30.

CIGRE
International Conference on Large Electric Systems, Paris, France, June 29-July 8. I. W. Gross, secretary, American Gas & Electric Service Corp, 30 Church St, New York 8, N. Y.

World Power Conference
London, England, July 10-12. H. C. Forbes, secretary, Consolidated Edison Co, 4 Irving Place, New York 3, N. Y.

*Addition This Week.



Output Week Ended April 29—5,902,168,000 Kwhr

Weekly Output, Millions Kwhr

1950	1949	1948
Apr 29 5,902	Apr 30 5,304	May 1 5,042
Apr 22 5,846	Apr 23 5,326	Apr 24 5,027
Apr 15 5,863	Apr 16 5,343	Apr 17 5,087
Apr 8 5,898	Apr 9 5,360	Apr 10 5,633
Apr 1 5,992	Apr 2 5,378	Apr 3 5,037
Mar 25 5,993	Mar 26 5,404	Mar 27 5,065
Mar 18 6,015	Mar 19 5,496	Mar 20 5,145
Mar 11 5,937	Mar 12 5,531	Mar 13 5,285
Mar 4 5,879	Mar 5 5,552	Mar 6 5,293
Feb 25 5,854	Feb 26 5,559	Feb 28 5,252
Feb 18 5,931	Feb 19 5,650	Feb 21 5,254

Percent Change from Previous Year

	Apr 29	Apr 22	Apr 15
New England	+18.1	+15.7	+16.4*
Mid-Atlantic	+11.3	+ 8.8	+ 7.9*
Central Industrial	+12.3	+ 8.5	+11.0
West Central	+ 9.9	+ 9.7	+ 9.9
Southeast	+11.4	+12.6	+11.1
South Central	+ 8.6	+10.4	+11.0
Rocky Mountain	+10.6	+ 9.6	+10.9
Pacific Coast	+ 9.3	+ 8.1	+10.7
Total United States	+11.3	+ 9.8	+ 9.7

*Revised

WASHINGTON COMMENT

RONALD D. ROSS

THAT BIG omnibus appropriations bill with federal funds for the fiscal year starting next July 1 is still in the early stages of its journey through Congress. But a last-ditch fight already has been started by the Bureau of Reclamation to save some of its pet projects.

The projects are familiar. Congress has refused to appropriate for some of them in several previous sessions. Included are the proposed Delta steam plant, additional federal transmission lines in California's Central Valley, and other transmission facilities in Montana and Colorado.

Last year, the steam plant and some of the transmission facilities were approved in the House but chopped out by the Senate. The axe struck sooner this year. These items were rejected by the House Appropriations Committee. Thus, there was a note of desperation in appeals of Interior officials to the Senate Appropriations Committee. And there was some confusion, too.

Secretary of Interior Chapman tried this approach: Give us the appropriations and we'll be in a better position to negotiate with the companies; if the companies sign contracts to provide the service the proposed federal facilities would give, we won't use the money.

Reclamation hasn't been able to negotiate agreements with power companies in three states, Chapman asserted, blaming the attitude of the companies.

Given appropriations for the controversial facilities, Reclamation could get contracts, he indicated.

This appropriation-for-negotiation argument isn't new. Southwestern Power Administrator Douglas Wright used it last year. And SPA got its money. But the short history of that affair lingers with the Senate committeemen.

Wright negotiated a contract with Oklahoma companies which he and the companies agreed would work. That contract has yet to receive the required approval of the Secretary of Interior. With SPA holding the construction funds, Chapman appears to be in no hurry to approve the contract—or send any appropriations back to the Treasury.

This type of veto power in the hands of the Secretary is an important feature of the contract negotiations. It's one which Congress will consider before approving more funds on a negotiation-first basis.

At the core of the present Reclamation fund fight is a more serious objection. The simple fact is that Reclamation is not negotiating contracts which—in the minds of Interior power planners—will eliminate the need for these power facilities. It's true, as Chapman reported, that Reclamation is trying to make "wheeling" agreements in the three areas. But Reclamation plans to build many of the facilities—if it gets the money—regardless of present or future contract negotiations.

It's not being shouted from the housetops, but present negotiations are not directed at averting federal construction of the controversial facilities. What Chapman, Interior, and Reclamation want is funds for these projects, not primarily support for contract negotiations.

If the Senate subcommittee gets to the heart of the matter, it's likely to give the same answer it gave last year.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Average outage hours per year for turbines in 1947 were about 1,793—broken down in part into periodic inspection (532), bucket or blade troubles (292), bearings (146), wheel or spindle (165), steam casing (177), nozzles and diaphragms (59) etc.

Rustiness of piping is one thing to consider in deciding how safe electrically water spray is as a fire-extinguishing medium.

Superheater coils and boiler tubes (rather than the turbine innards) are what limit higher steam temperatures. The greater gains might be achieved by metallurgists concocting the metals, even if they had to be replaced at intervals of 5 yr or more, because of slow deterioration.

Hydrogen cooling of generators is being done by half the utilities at more than ½ psi and up to 15 psi at times of peak. Some current machines are designed for 25 or 30 psi of hydrogen.

Construction fatalities on the Manhattan Project were 35 times as numerous as those resulting from exposure to external radiation (only 2).

Central arrangement of heaters, piping, auxiliaries and control are facilitated if turbo-alternators are right-hand and left-hand in pairs.

Coal piled by crane and locomotive will take more than twice as much area as coal piled by mobile earth-moving equipment to the same height, because the latter fills the valleys where the tracks were.

Each of two or more generators should be grounded through R or X if they are connected to a common generator bus which has no outgoing feeder attached to it; with such feeders the preferred practice is a single grounding transformer (with resistor) off the bus.

ELECTRIC HOUSE HEATING
What Must Be Done?

F. A. COMPTON
Vice President, The Detroit Edison Co

SINCE 1946, several large manufacturers have been actively promoting the sale of electric radiant heating panels for a complete electric house heating installation. In the Detroit Edison service area, instead of the occasional inquiry by customers about developments in this field, there has been noticeable customer interest to the point where now they are inquiring, "How *soon* will we have electric house heating?"

In the face of such growing interest, we must recognize that our responsibility lies in directing and assisting in the orderly development of this load so that our customers do not suffer from ill advised installations under improperly controlled conditions. After all, there is no difference in the development of this electric load from that of any other major electric device, such as the range, clothes dryer, water heater or freezer.

Frankly, it is irritating to hear the remark that electric house heating is too great a problem for us to handle—that it will raise havoc with our rate structure, our generating and distribution facilities—and that we should discourage it. We all know that you can't stand still in any business. If, for instance, our rates don't fit electric house heating, then we haven't the proper rate structure. With this as a premise, let's look at electric house heating, as it affects our customers and our companies.

The Detroit Edison Co Study

There are about 20 radiant heating panel installations in the Detroit Edison Service area and we have gathered a considerable amount of data concerning these. Our study began at the start of the 1949 heating season and will take another six months to complete.

Our approach to electric house heating, broadly speaking, consists of six basic factors. Four of these factors, and related results of our study, are of importance from the customers' point of view:

BENEFITS—The appliance should render a real service to customers. It should help them enjoy the greater convenience and comfort of electric living.

It is practical from an engineering viewpoint to heat homes completely with electricity. Advantages in favor of electric house heating include cleanliness, freedom of odor, safety and the related shortages of competitive fuels.

One customer has found it necessary to use auxiliary sources of heat to supplement his installation, while two are using gas and oil, respectively, to decrease the operating cost of the electric installation. We have had five customers remove their installations due to dissatisfaction with

Our Responsibility Toward Electric House Heating

1. Give the same consideration, and perhaps more, to electric house heating that has been given to other newly developed applications of electricity.
2. Continue to remain thoroughly acquainted with all the developments of electric house heating as it affects the customer, our industry and manufacturers.
3. Have available personnel who are thoroughly familiar with this use of electricity and who can assist in its development.
4. Be in a position at all times to give unbiased opinions on all phases of complete electric house heating to combat the extravagant and deceptive sales claims of some distributors of complete electric house heating equipment.
5. Keep a constant flow of information regarding any development, problem or data among members of the industry.

Abstract of a paper presented before the EEI Annual Sales Conference, Chicago, Ill., April 3-6, 1950.

WHAT DOES IT COST TO HEAT A HOUSE ELECTRICALLY ?

Type of Residence	Heated Space (Cu ft)	Energy Use (Kwhr) (During February, 1950)	Degree-Days	Kwhr per Heating Season	Load (Kw)	Cost of Energy per Heating Season
House A-Fully Insulated	7,735	1,689	1,073	11,050	8	$240
House B-Partially Insulated	6,531	2,051	1,091	13,141	5	$285
House C-Not Insulated	6,500	4,570	1,073	28,440	7	$620

OPERATING DATA for three of twenty metered house heating installations in the Detroit Edison service area. Electric heating installation was removed from House C on Feb. 13. Energy consumption was estimated for the remainder of February and the heating season

Customer interest lies in benefits and cost . . .

operating cost or performance. But the twenty remaining customers, with one exception, are satisfied with its performance.

COST OF OPERATION—**The cost of operating the equipment or appliance should not be so great as to limit its use, result in customer complaints or represent a constant hardship to the user.**

The one disadvantage to the electric house heating customer today is the cost of operation; however, we have eight customers who are satisfied with its operating costs. The average operating cost per heating season for each of these installations will be about $230 with an average installed capacity of 8 kw for these eight customers.

Our study to date indicates that a completely insulated home consisting of 15,000 cu ft of heated space in Detroit, with 6,500 degree-days in a year, can be heated with a use of 21,000 kwhr annually (see also chart "What Does It Cost To Heat a House Electrically?").

SERVICE PROBLEMS—**The appliance should withstand rugged use and its mechanism should not be so complicated that frequent service is necessary.**

Our experience in regard to service problems is limited since all of our installations are too recent; however, our heating engineers who periodically inspect our installations do not report any major or frequent service calls.

POTENTIAL MARKET — **It should represent a real value to the customer so that it broadens the market, even though its initial cost may be somewhat higher.**

Number of customers requesting electric house heating service can conceivably increase quite rapidly, since the many advantages may outweigh the higher cost of operation in the opinion of many users and create an active potential market.

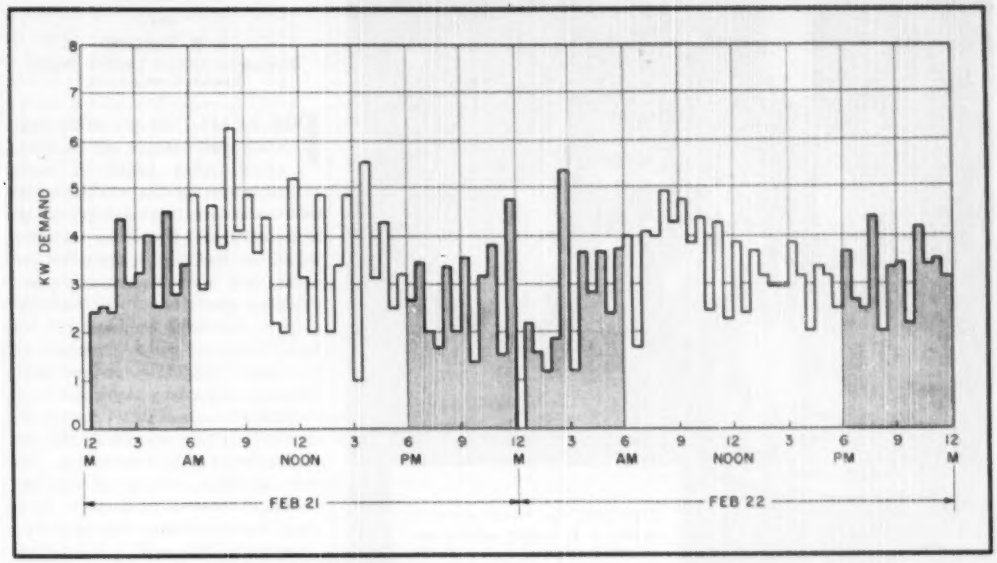
From the utility point of view, two factors, and related findings, should be considered:

REVENUE—**What is the annual use of the appliance? Generally, any business which tends to increase the existing ratio of net to gross income should be promoted.**

At the present time we apply the residence rate with the lowest step at 2.25¢/kwhr. Last November, we sent letters to all the customers with electric heating installations agreeing to serve them at the present rate for a period of a year. At the end of that time we shall be able to analyze the cost of serving this load and determine whether or not this type of business will require an adjustment in our rate schedule.

A market for application of electricity, as large as electric heating and which will use an annual average of 21,000 kwhr for a 15,000 cu ft home, is very tempting from our viewpoint. We know that it performs a service which may be well received by our customers.

LOAD CHARACTERISTICS—**Here we must know many facts. What is the connected load? What**



DEMAND CURVE of a typical electric house heating installation during February, 1950. This house in the Detroit Edison service area has a connected load of 8 kw. Local temperature conditions resulted in 46 degree-days for Feb. 21 and 48 degree-days for Feb. 22.

utility interest, revenue and load characteristics

is the maximum demand? When does it occur? How long does it last? What will be the effect of many installations on system peak?

We do not have conclusive data on the load characteristics of electric house heating; however, our installations vary in size from 5 to 15 kw in connected load, averaging about 8 kw. Based on the group maximum demand, load factor will be a little less than 25% and peak responsibility will be over 60% of connected load. Connected load of 15 kw for a home of 15,000 cu ft would have a peak demand of 9.6 kw and a non-coincident group maximum demand of 11.7 kw.

The variable load between winter and summer is the big problem with the electric house heating. However, this situation could be offset by seasonal demands for such uses as air conditioning in the summer, and in some cases, irrigation during the summer for the farm customers.

What is the industry doing about electric house heating? The EEI Housheating Committee set out to answer this question. Questionnaires were sent to 36 utilities serving from 76,000 to 1,000,000 customers, in service areas ranging from 96 to 89,000 sq miles. Returns received from 32 of the companies are summarized as follows:

—Ten reported no electric house heating installations and none are presently planning to promote them.

—17 reported active promotion by manufacturers of electric house heating units, predominantly of the glass radiant panel type.

—15 have installed metering equipment on house heating installations.

—Only seven companies actually discourage the use of electricity for house heating, while 25 maintain a neutral viewpoint, giving the customer a complete explanation of the advantages and disadvantages.

—While 17 companies apply the residence rate and one the commercial rate, four companies provide a special rate. These special rates include a charge per kw of demand with 1.5-2¢ kwhr charges plus a fuel adjustment. Average residence rate paid for heating per kwhr ranges from 0.8 to 3.2¢, with an average of 1.9¢. Five companies do not believe the residence rate adequate and contemplate a rate change for excessive kw of demand.

—The majority of cases indicated that house heating customers are satisfied with performance but not with operating costs.

—Complete house heating installations by utilities range from 1 to 145. Connected load per installation varies from 4 kw in a 3,200 cu ft home to 43.7 kw in a home 27,000 cu ft in size. This averages about 12 kw for a home of 9,500 cu ft.

—The average installation as reported uses 0.24 kwhr per degree-day per kw installed in insulated homes and 0.32 for homes not insulated.

Based on the results of this survey it would appear that power companies are showing the same positive and unbiased approach to the electric house heating load as was shown in the past with any other new electrical application.

LIFE TEST for transformer oils. Author R. F. Seubert watches accelerated oxidation test of 8 oils in thermostatically controlled unit that holds temperature at 95 C. Oxygen is bubbled through water in flasks and passes into heated oils that are tested periodically for interfacial tension and sludging. Comparisons are made of oils inhibited with the DBPC solution and those without. Oils in this picture have been on test 46 days. Coils in tubes are iron-copper catylists

New Life For Transformer Oils

Reported here are tests of a new inhibitor that demonstrates its ability to extend the useful life of transformer insulating oil 1,400% and more. How to apply this inhibitor to new and used oils is described and commonly asked questions are answered

R. F. SEUBERT
and
B. R. SARCHET
Development Section, Chemical Division
Koppers Company, Inc

FOR NEARLY 30 yr, utility engineers have sought an inhibitor which, when added to transformer insulating oils, would increase their resistance to oxidation and extend their useful life. Many suggested inhibitors had to be discarded because they were water-soluble and oxidation products were oil-insoluble.

Now, however, an inhibitor has been developed which possesses all the desired properties and, in addition, is in such easily-usable form that its application presents no more problems to the utility than the application of insulating oils themselves. The new inhibitor, developed by the Chemical Division of Koppers Company, Inc, is known as Impruvol 20.

Impruvol 20 is a 20% solution of di-tert-butyl-para-cresol*, in transformer oil of select quality.

DBPC As An Inhibitor . . . DBPC has been recognized as a valuable inhibitor for some years and has received considerable acceptance in the related field of turbine oils.

Two factors delayed the extensive use of this inhibitor in transformers. First, DBPC was a solid and was not readily available in liquid form. Second, sufficient experimental data were not available to utility engineers.

The first difficulty was resolved by preparing the inhibitor in liquid form. The second difficulty was met through an exhaustive series of tests and the assembly of complete data for the guidance of utility engineers.

The collection of sound data was aided greatly by the close cooperation of R. G. Call of the American Gas & Electric Service Corp; E. F. Walsh of the Narragansett Electric Co; Dr. G. H. von Fuchs; and F. C. Doble of the Doble Engineering Co.

Test Methods Used . . . While the American Society for Testing Materials is presently considering several methods which may be suitable for testing inhibited oil, none has yet received official approval. Dr. von Fuchs has proposed to the ASTM that

* For simplicity, di-tert-butyl-para-cresol will hereafter be referred to as DBPC.

a modification of the turbine oil stability test be used for testing inhibited transformer oils. This test involves oxidation of the oil at 95 C with oxygen in the presence of water, and uses copper and iron as catalysts. In this modification the amount of water is decreased from 20% to 2% to prevent rusting, and a glass "umbrella" is introduced above the iron and copper catalysts for the same purpose.

Messrs Call and Walsh have, for several years, been testing inhibited transformer oils by methods which they found suitable for their own use. Call used the ASTM sludge accumulation test (operating at 120 C) modified to include interfacial tension measurements (IFT) at desired points, followed by naptha insoluble sludge and neutralization number determinations at the conclusion of the test. Walsh used a test procedure operating at 95 C and incorporating IFT, sludge, and neutralization number determinations.

These men, and others, have pointed out that oil is in the early stage of sludging when the IFT is about 15 dynes/cm.

In laboratory tests conducted by Koppers the von Fuchs method for determination of oxidation stability was adopted as the primary standard, and the Call method was used during early stages of the program as a basis for correlation. In both cases the oxidation was discontinued when the IFT reached approximately 15 dynes/cm.

Tests on Uninhibited Oils . . . Keeping in mind that early stages of sludging begin when the interfacial tension measurements reach approximately 15 dynes/cm, tests were continued only until this value was reached. Quantities of four commercial uninhibited transformer oils were purchased and put through the tests as specified above without the inhibitor and with varying quantities of the inhibitor.

The results on one oil were as follows:

	Time to Reach Sludge Stage	*Increase in Oil Life*
Uninhibited	5 days	—
0.5% of DBPC solution added	23 days	460%
1.5% of DBPC solution added	70 days	1,400%

Parallel results were obtained in the tests on all four oils. Complete data

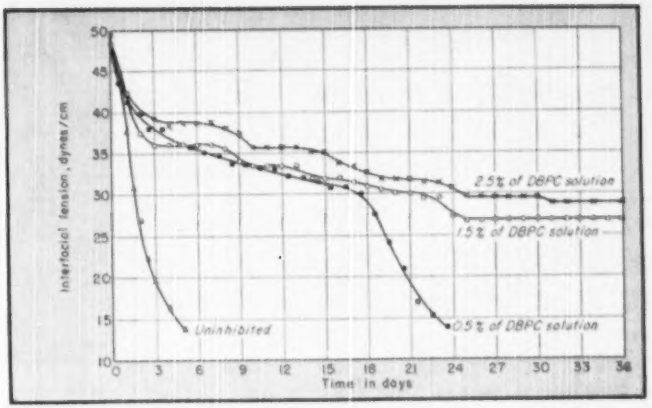


FIG 1—RESULTS OF 95 C OXIDATION TEST confirm the fact that an inhibited oil "breaks" under oxidation as slow or slower than in the corresponding uninhibited oil

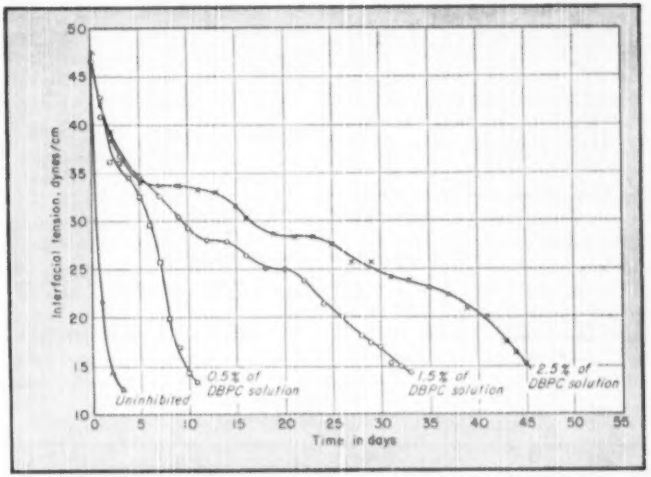


FIG 2—RATE OF BREAK of a reclaimed (to an IFT of 47.6) inhibited transformer oil, under 95 C oxidation test, is slow indicating it will not sludge between inspections.

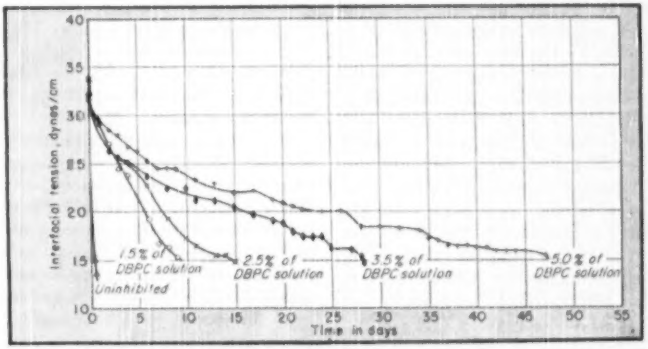


FIG 3—EFFECT ON OXIDATION RATE of inhibiting used oil reclaimed to only 33.7 IFT using 0.33 clay per gal. Inhibition stabilizes oils reclaimed with small amount of clay

TABLE I—How Four New Transformer Oils Stood The 95 C Oxidation Test

Oil Sample	% by Vol Inhibitol 30 Added	Period of Oxidation (Days)	Final IFT (Dynes/Cm)	Chloroform Soluble Sludge (Grams)	Neut No. of Oil	ASTM Color After Test
No. 1	0	9	13.7	.018	.68	2
"	0	14	13.3	.172	.78	4
"	0.5	23.5	13.9	.021	.54	2
"	1.5	20	14.5	.022	.60	2
"	2.5	36	29.0	Being oxidized to break point		
No. 2	0	5.5	13.9	.023	.56	2
"	0.5	38	14.6	.014	.62	2
"	1.5	36*	29.0	Broken oxidation coil		
"	2.5	36*	29.3	.030	.34	1.5
No. 3	0	4	16.4	.008	.44	2
"	0	7	15.0	.064	.51	2.5
"	0.5	30	15.0	.035	.59	3
"	1.5	36*	25.0	.030	.34	2.5
"	2.5	36*	29.8	.031	.15	2
No. 4	0	5	13.7	.022	.60	2
"	0.5	20	15.5	.014	.61	2
"	1.5	36*	20.6	.021	.35	2.5
"	2.5	36*	26.7	.028	.23	2.5

* Test discontinued due to long life.

TABLE II—How Two Reclaimed Transformer Oils Stood The 95 C Oxidation Test

Clay Treat Lb Clay/Gal	% by Vol Inhibitol 30 Added	Time of Oxidation (Days)	Final IFT (Dynes/Cm)	Chloroform Soluble Sludge (Grams)	Neut No. After Test
1.85	0	3	12.6	.019	.44
1.85	0.5	10-3/4	13.3	.013	.58
1.85	1.5	33	14.5	.013	.42
1.85	2.5	45	14.2	.017	.44
0.33	0	~1/2	13.8	.031	.64
0.33	1.5	9	15.4	.047	.68
0.33	2.5	15	14.9	.028	.51
0.33	3.5	28	14.9	.023	.53
0.33	5.0	47	15.4	.016	.52

TABLE III—How Much Does DBPC Treatment Cost

A. FOR A NEW UNINHIBITED TRANSFORMER OIL

	Days of Test Life	% Increase in Test Life	Total Cost	Increase in Cost
Uninhibited Oil at 21c	5	.....	21c	.....
DBPC Costing 1.5c Added	22	440%	22.5c	7%
DBPC Costing 4.5c Added	70	1400%	25.5c	22.2%

B. FOR AN OLD OIL RECLAIMED BY CLAY TREATMENT

	Cost of Clay Plus Oil Loss in Process	Cost of DBPC	Total Cost	Test Life
Clay Alone (1 lb per gal)	6.7c	none	6.7c	2
Clay (.33 lb per gal)	2.2c	4.5c	6.7c	9

on the oil condition at end of the tests are shown in Table I.

It has been claimed that only highly refined oils would respond in such a manner to the addition of an inhibitor. The test results disproved this contention, at least insofar as the inhibitor DBPC is concerned. Similarly, there have been those who feared that an inhibited oil might "break" too quickly under oxidation, allowing a transformer to sludge between normal inspections. No evidence to substantiate this theory was found in the tests, the break in all cases being as slow or slower than in the corresponding uninhibited oil (Fig 1).

Tests on Mixed Uninhibited Oils . . . Since mixing of transformer oils is rather common practice in utilities, it was considered advisable to run tests on such oil. Consequently, quantities of the four oils used in the above tests were mixed with two additional commercial oils in equal proportions and run through the tests both uninhibited and with 0.5% of the inhibitor added.

In this case both the uninhibited and the inhibited specimens ran somewhat longer than the individual oils. This was believed to have been due to one or more of the six oils now under test being rather highly refined and susceptible to inhibition by the aromatics in one or more of the less refined oils which were contained in that mixture.

Again, the rate of break was very slow.

INTERFACIAL TENSION TEST of oil sample during accelerated oxidation test. Oil is floated on water in beaker and a platinum wire ring pulled through the interface. Instrument measures minute amounts of oxidation products in the oil

Inhibition on Used Oils . . . Large potential savings to the electric power and distribution industry are offered when oils can be reused.

It appeared worthwhile, therefore, to determine the degree of inhibition obtainable in such oils through clay treatment and with various amounts of the DBPC solution. Six samples of a used transformer oil with an existant IFT of 17.5 dynes/cm were obtained and put through tests.

One sample was treated with 1.85 lb of clay per gallon of oil. The clay treatment was performed by passing the oil through a bed of clay at or near room temperature. It removed many of the products of oxidation. The clay treatment raised the interfacial tension of the sample from the 17.5 dynes/cm to 47.6 dynes/cm. While the finite test life of the reclaimed oil was not as great, uninhibited or inhibited, as new oil, the percent improvement at corresponding degrees of inhibition is nearly the same. Results of the tests made by adding the inhibitor solution to the treated used oil were as follows:

	Time to Reach Sludge Stage	*Increase in Oil Life*
Uninhibited	2 days	—
0.5% of DBPC solution added	10 days	500%
1.5% of DBPC solution added	32 days	1,600%
2.5% of DBPC solution added	45 days	2,250%

As in the tests on new oil, the rates of break were slow (Fig 2).

In Fig 3 data is shown on the in-

hibiting of one of the samples of used oil reclaimed to only 33.7 dynes/cm. This data is very interesting in that it shows that even an oil reclaimed with a small amount of clay can be made into a stable oil by inhibition. Data on the condition of these two oils appear in Table 2.

Tests were made on oils reclaimed with four other degrees of clay treatment and down to as low as 1 lb per gal. The lesser the degree of treatment, the less the finite life, both uninhibited and inhibited, but in all cases the percent improvement by adding the inhibitor was about the same.

Tests on New and Used Oil Mixtures . . . Still another test was conducted, this one to determine results on a 50-50 blend of new inhibited oil and an uninhibited reclaimed oil.

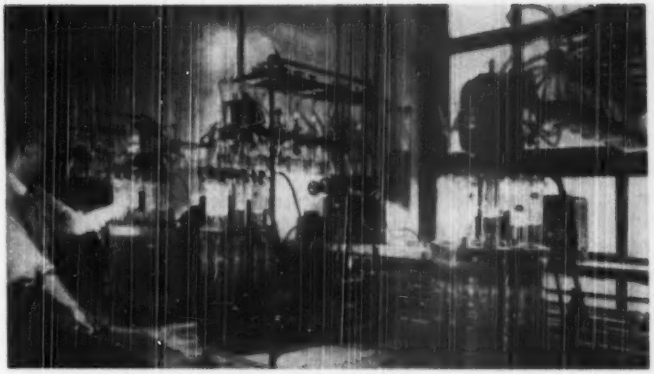
Obviously, the results obtained here were slightly less than the arithmetical average of the inhibited new oil and the inhibited reclaimed oil separately. Nevertheless, with 2.5% of the DBPC solution added, there was a 10-fold increase in the test life of the mixture. This indicates that even though some of the life of a new inhibited oil is lost in such a process, there are still economies over a mixture of uninhibited oils.

Benefits vs Cost . . . While the test data indicates that use of the DBPC solution adds materially to the usable life of both new and reclaimed oils, the utility engineer is, of course, basically interested in the savings in relation to the costs of using this solution.

Using an assumed cost of 21¢ per gal for new uninhibited oil, Table 3 shows total cost after varying quantities of the DBPC solution have been added.

Table 3 also includes a similar computation on the cost of combining the clay treatment and addition of the DBPC solution to reclaimed oils and shows how the use of clay and DBPC together is more economical than clay alone:

This data indicates 450% increase in life for the same cost by using clay plus inhibitor rather than clay alone. It becomes clear that by the proper combination of clay and DBPC in the treating of used oils considerable savings by the utilities can be realized.



MASS OXIDATION TEST—battery of three oxidation test setups testing 24 different transformer oils simultaneously. Highly refined oils should be tested for susceptibility to DBPC

Some Questions Answered . . . Certain questions will arise concerning the use of the DBPC solution as utility engineers give it consideration. Some of the more important questions are answered herewith:

Q. *Is DBPC affected by customary oil treatments now in use?*

A. Customary oil treatments are of several types. One type includes blotter presses, centrifuges, and filter presses to remove water and sludge. None of these affect DBPC. Another type involves heating the oil under vacuum to flash off low boiling acids. This also should not affect DBPC. A third type involves various kinds of clay treatments to remove acid impurities from the oil. When such clay treatments are performed below 90 C, the inhibitor is not removed. The bulk of the commercial clay treating systems are operated at temperatures of less than 90 C, and generally they are operated at transformer temperatures (60-70 C) or room temperature.

Q. *How will presence of DBPC affect the utility engineers' past oil maintenance program? Can treatment frequency be cut?*

A. In this case let us speak first of new oils. If DBPC is used in new oils, utility engineers will still want to remove water by blotter presses at specified inervals of time since water affects the dielectric strength. However, the length of time before they will have to filter out sludge to reclaim the oil or dispose of it as fuel will be greatly increased if DBPC is used. In reclaimed oils, advantages are even more apparent because companies which have been reclaiming with clay have at times been obtaining very unstable oils. This means that they have to operate on a fairly frequent reclaiming cycle to keep the oil conditioned. By using DBPC they may increase the length of time between clay treatings many-fold and thereby cut their maintenance cost decidedly.

Q. *If a utility uses a highly refined oil, what guides should be applied if they choose to add DBPC to it?*

A. The best guide is, of course, to run an oxidation test on all oils to determine their susceptibility to DBPC. Present test data, however, would indicate that 0.5% to 1.5% DBPC solution should give ample stability to most oils encountered.

Q. *If a utility has been buying an inhibited oil, how should it be guided in adding new oil that it chooses to inhibit by the addition of DBPC. What degree of inhibition will result in the final oil? How can that degree of inhibition be determined?*

A. In general, no incompatibility has been noticed between DBPC and other inhibitors. None would be expected since DBPC is very inert to chemical reactions. A utility, therefore, should be able to mix oils with DBPC inhibited oil and each should carry on its work to its own degree of proficiency. It might be wise to run at least a short oxidation test to determine if the action is satisfactory. However, unless the other inhibitor is of a peculiar nature, no trouble should be anticipated.

Distinctive Design Features

Analysis of over 200 check-charted details shows trends incorporated to thwart high construction costs, improve thermal performance, minimize operating staffs, focus the controls, all without sacrifice of reliability

WHAT HAVE power plant designers done to contend with the high cost of the times? This survey shows they have done dozens of things other than just omit or minimize the building, adopt high steam conditions and centralize the controls. Ingenuity and pioneering had a fine new opportunity for play and these were manifested in built-in details of widely diversified nature recorded in the fold-in check charts.

1. Fuel handling has emphasized the use of conventional or modified earth-moving equipment.
2. Remote control of circulating pumps located at the screen well is an increasing practice.
3. Condensers are being chosen to permit cleaning in service.
4. More plants necessarily have dust collectors.
5. Reheat is on the increase except where superior reliability is deemed to call for boiler headers.
6. One boiler per turbine is the dominant pattern.
7. Induced draft fans are often outdoors (occasionally omitted) with hydraulic speed-adjustment drives prevailing.
8. Hydrogen cooling remains mostly at 15 psi, but there is a trend toward 25 or 30 psi.
9. Direct connection of alternators to outgoing transformers eliminates the former generator bus.
10. Exciters are usually direct-connected mechanically.
11. More than half the new plants have thoroughly centralized the plant controls with the operators able to see the turbines.
12. Auxiliary power is dominantly obtained from the generator terminals.
13. Shift operators per machine have been sharply reduced.

These are highlights of an intensive and comprehensive report of the design features of the crop of power plants initiated since the end of World War II.

In the paragraphs that follow — and in the accompanying fold-in check charts — closer, more detailed examination will be given design trends in various component departments of today's power plants.

General Features

Architectural design of power plant structures and the provision of facilities extending pretty much throughout them are focal points of analysis for least-cost consistent with best results. Arrangement aimed at collecting operating areas so that most equipment can be operated at one or two levels is an indicated movement. Fourteen plants are classed as one-level and 46 are two-level. Some 22 were pointed toward horizontal lay-out; Station No. 46 on the check chart reports the boiler firing floor at the same level as the turbine.

Completely outdoor plants total only 4. These are all in the South. But there are a large number with varying degrees of "outdoorness." Six have provided a canopy over the firing aisle for outdoor boilers. Seventeen plants (again mostly in the South) have gantry cranes for servicing turbogenerators; 7 of these have the units in a housing on the roof. The others have removable roof slabs to afford access to the units. Others (No. 39 for example) report a removable turbine enclosure.

Ventilation of the plant is met in two ways, usually not employed together. In 24 plants (mostly Southern) there is forced-air ventilation. Six plants employ grating floors throughout, plus 2 in part; one more uses gratings only for the upper boiler levels and another everywhere except for the main operating floor.

Structurally an effort has mani-

of 81 Postwar Power Plants

festly been made to supplant high-cost brick walls with lighter, cheaper materials. However, only a few replies mention the point. One (No. 58) says "concrete building," another (No. 34) "insulated wall panels" and still another (No. 44) "aluminum" was used.

Relays are located on the floor above the control room in plants No. 4, 6 and 10, in the control room in plants No. 20 and 28 and on the level below it in plant No. 1.

Twenty of the 81 listings report design for quick pickup of load.

Public address system throughout the plant is a feature of 33 stations. Two (No. 26 and 27) say "partly," No. 12 had a temporary speaker system installed for the starting-up period.

Corrosion prevention in the Southern plants follows the cathodic protection practice of the area for the pipes and conduits. But plants No. 51A and 51B apply it to the pipes only and No. 65 only to the gas fuel line. Magnesium anodes protect the fuel-oil tank in plant No. 63. Ferrous surfaces were Parkerized before painting in plants No. 34, 35 and 63.

Fuel and Fuel Handling

Coal Is Fuel in 50 of the 81 plants. Nineteen burn natural gas and six oil. Of the 50 coal plants 8 employ gas as an alternative fuel and 3 on the East Coast resort to oil. Ten "gas" plants (mostly South and Southwest) rely on oil as a secondary fuel. Buried oil storage tanks are used in nine plants of which four remind that it is used mainly for light-off.

Earth-moving equipment dominates the field of fuel-storing and reclaiming activities of 44 of the 50 coal-burning plants. Four use locomotive cranes, one of these in conjunction with earth-moving facilities and another exclusively. The four reporting stationary cranes for barge unloading all say in conjunction with earth-moving equipment; one in conjunction with a collier, presumably self unloading. Three plants have mine-mouth locations. Drum-type hoists are reported in five instances and a forth uses a diesel crawler-crane for the purpose.

Car thawing pits or sheds have been provided at 13 plants and there is at least one additional installation in contemplation. Ten of these do the thawing with oil heat and two with gas. Five use a guillotine-type blade to break the frozen mass. Car shake-outs are installed in 25 of the coal-burning plants.

For moving coal into the crushers and bunkers there are 23 cases of belt conveyors listed. Of these 15 also have an installation of flight conveyors. Plant No. 4 has special conveyors to empty the bunkers. Special features mentioned in supplementary information are: Weightometer in conveyor system (No. 1); coal scales between-bunker and feeder (No. 1); track scale (No. 8); automatic coal sampling (No. 20 and 44).

Location of pulverizers directly under the coal bunkers was achieved in 40 of the 50 reported coal-burning plants. Stainless-steel coal chute was reported for plant No. 4.

Condensing and Cooling Water

Deepened channels were necessary at 9 plants to afford adequate condensing supply. Facilities for recirculation, primarily to prevent ice at the intakes, were provided at 30 plants; in addition one made partial provision. Two plants have impounding basins for recirculation and another is contemplating one as an adjunct to future recirculation. Placing the circulating pump at the screen well is a feature of 29 plants. Differential head actuates the screens at 12 plants and in two others it sounds an alarm; a time clock does it at plant No. 8.

Chlorination of condensing water for slime control is practiced at 54 plants. Three (No. 2, 17 and 73) use sodium hypochlorite for the desliming; another is contemplating it. Marine fouling in the intake-discharge lines is controlled in plant No. 68 by reversing the flow.

Induced draft cooling towers are practically the rule in Southern plants but three reported installations in other areas.

Condenser

Condensers installed outdoors are common in the South as a concomitant of outdoor turbines (14 stations). One (No. 55B) has twin condensers with the turbine between. At plant No. 60 condensers are flat oval in shape with vertical pumps. In just two reported instances (No. 13 and 20) the condenser is the foundation for an (indoor) turbine.

Divided water boxes or two-pass designs arranged to facilitate cleaning under part-capacity were reported by 15 and 39 plants, respectively, (eliminating duplications). A bypass for reversal of flow is afforded by 12 installations.

Heaters are in the condenser throat at 13 plants; one has three.

Deaeration in the condenser hot well prevails at 45 plants; mechanical deaeration is in use at one.

Positive measures to prevent leakage were taken in 27 plants and to minimize condensate refrigeration in 43 plants.

Ash Control and Disposal

Dust collectors are installed outdoors at 27 of the coal-burning plants. Mechanical collectors exceed

the electric in the ratio of 36 to 22, but 7 of the mechanical installations are accompanied by electrostatic. In addition, electrostatic collectors are contemplated at four plants. The latter type are supplied by electronic rectifiers at three plants. Stack nozzles to accelerate the gases and diffuse the emission were reported for plants No. 9 (to 108 fps), 38 (to 88 fps) and 75 (to 123 fps).

Retractible soot blowers are practically universal, being reported for 51 plants as complete or partial installations.

Dustless unloaders to condition the flyash are installed at 16 plants. It is removed continuously from collectors at 9 plants. Four plants (No. 8, 18, 33 and 34) have means for reinjecting combustible flyash into the furnace but it is not in service at one of them.

Heat Cycle Apparatus

Reheat was adopted for 9 plants and in 7 reheat will be the cycle for subsequent units. Another has it for the first unit (plant No. 11) and will probably have it for the next. Of the 35 cases where it was not adopted there are two where it will be applied for subsequent units and two others where it probably will.

Extraction ranges from three to eight points, the largest numbers naturally associated with the highest pressures and temperatures and the larger ratings.

Feedwater heaters are provided with bypasses in 30 installations but in four of them the provision is only for the high-pressure units.

Deaeration in the feedwater heaters is an extensive practice (59 report). Fourteen of these are of the open floating type and there are eight additional.

Sulphiting of feedwater is practically universal, being reported for 45 plants. Makeup water is evaporated and zeolited in 32 plants; evaporation alone is the practice in 34 others. Continuous blowdown is practiced at plant No. 29. Plant No. 38 employs alum, soda ash and filtration.

Corten steel in the exit of air preheaters prevails in 28 plants. The hot air ducts under pressure are welded in 32 plants. In 59 hot air ducts have bellows joints.

Plant No. 20 adopted a compressor evaporator.

Steam Generation

One boiler per turbine is definately the dominant practice (reported for 60). The presence of prior or simultaneous units, of comparable proportions, frequently results in adoption of three or four boilers for a pair of turbines with headers to couple them. Other instances (7 of them) reflect the decision to get the added reliability of two for the first turbine but one for each subsequent turbine.

Completely outdoor boiler installations are reported at three plants (all in the Southwest) and semi-outdoor for 19. However, the practice has spread to include two Middle Atlantic plants and three in the North Central area.

Radiant-furnace boilers are named in 36 plants. There are 32 with triple-drum units and 46 with dry-bottom sloped-wall furnaces. Only two plants (No. 4 and 29) reported a slag-tap furnace. Plant No. 35 uses a spreader stoker along with use of damp gas as a secondary fuel. Tangential corner-firing is the order at 19 plants, and in all cases provision is made for vertical or tilting adjustment to match the load and needs for control of superheat temperature. No external combustors (cyclones) were reported although the number is known to be increasing.

Thirty-one plants have boilers matched in capacity to the ratings of standard turbines. Two stated a 10% excess for the boiler. Only one plant (No. 63) reported pressurized furnace without induced-draft fan.

Superheat temperature is controlled in 18 plants by attemperator or condenser and in 27 by damper control as a measure secondarily in conjunction with tilting of burners where this is provided. Flue gas recirculation is employed at plant No. 20.

Economizer valve control is manual-automatic at 3 plants and one additional has it applied only to the first unit, another with remote control.

Superheater tubes are reported stabilized in the following alloyings: Ti (Plant No. 1, 7, 12, 15, 17, 32 and 50); Ti Cr Mo (Plants No. 8 and 38); Cb (Plant No. 3 and 20); Ti Cb (Plant No. 18); ASME SA 209 and 210 (Plant No. 39).

Television has been applied at six plants for gage glass observation and in addition for flame observation at plant No. 20. Plant No. 15 is considering it for the latter purpose.

Fans and Pumps

The rule is two forced-draft and two induced-draft fans per boiler (35 plants). There are two instances of one forced-draft and two induced draft, also two of the reverse. Of the two instances of single fans one (plant No. 28) has two motors on each fan. Twenty-five plants have both fans outdoors. In five more merely ID fans are outdoors. Plant No. 67 has the FD fans indoors in the winter.

Fans are sized for ⅓ overload on the turbines in 42 instances; for ½ overload in one; one plant has three sets of fans of half turbine-boiler rating. There are three or four more plants that apply the margins only to the boiler feed pump. Drives are hydraulic in 17 entries with two additional (No. 19 and 32) stating for ID fans. Electric or magnetic drives prevail in 6 plants with confinement to ID fans in plants No. 8, 34, 38 and 78. In the latter case the FD fans have inlet vane control. Plants No. 7 and 40B report hydraulic couplings on the boiler feed pump. Electronic control regulates fan speed at plant No. 47. Liquid-slip regulators are used for speed control of induced-draft fans at plants No. 26, 27 and 36 and for the boiler feed pump at plant No. 25.

Turbine oil pump is motor-driven at 42 plants and steam driven at one (No. 65).

There are positive-displacement rotary vacuum pumps in 11 plants but in one it is only for priming.

Piping

Chrome-molybdenum steel is practically universal for the steam piping. Cathodic protection for buried piping has been applied in 16 plants, mostly Southwest. Outdoor piping is commonly insulated against freezing, plant No. 62 including air and gage lines. Electric heat is used to prevent freezing of valves at 14 plants, at No. 15 also the control piping and soot-blower heads but at No. 4 only for the drain valves of the outdoor air receiver.

The oil pipe is electrically heated at No. 2. Plant No. 56 has a tracer system to prevent freezing. Plant No. 8 reports "electrically welded piping systems, double valves in cross-connections and breech-block valves for steam-BF"!

Turbine

Turning gear is a universal provision, not one of the 81 listed plants reporting none. Almost the same is true of automatic poor-vacuum trips, all but 9 of the 81 having installed them. Comprehensive turbine-supervision panels were provided at 52 plants; automatic steam-seal regulators at 26.

In the South and on the West Coast there are seven plants with the generator located on the roof, another with the generator on an 8-ft pedestal flanked by twin condensers. In two Middle Atlantic plants the condenser supports the turbogenerator.

Stabilization of chrome-nickel-moly blades and cylinder with Columbium was reported by plants No. 12 and 20. The buckets also contain tungsten in these plants along with No. 19 and 35. Initial pressure regulator limits temperature changes in the turbines at plants No. 4, 7, 12, 53 and 68. Excessive starting speeds are prevented by a governor device at plants No. 10, 12, 32, 40B, 44 and 69.

Ratings of the initial unit were duplicated in 41 of the 81 plants.

Plant No. 8 has a turbine designed for maximum economy at full-load with provisions for part-load in the future. The same plant uses distilled water in a closed system to cool the oil and hydrogen. At No. 60 minor changes in nozzles and first stage blading raised the 37.5 Mw continuous capability to 42 Mw peak.

Alternator

Hydrogen cooling with the surface coolers in the stator shell is practically universal, 73 plants state 0.5/15 psi and at 8 provision has been made for 25 (one is 30) psi. Correspondingly universal is the dependence on temperature detectors in the stator coils (79 of 82 plants). Less universal is the provision of a temperature recorder for the rotor.

Condensate cools the hydrogen in 25 plants, well water in 19.

Preferred standard machine ratings are used in practically half the plants. Voltage is 22 kv in plants No. 22, 23 and 24 and 16.5 kv in plant No. 4; otherwise presumably 13.8 kv. Two double winding generators were reported—plant No. 20 for the low-pressure end of 125 Mw and the 100 Mw unit of plant No. 74.

Alternators are connected direct to transformers in 48 instances. Especial effort was made to keep the generator leads short in 35 plants. In No. 53 and 54 they are copper (100 ft) on outdoor pedestal insulators. Isolated phase design prevails at 31 plants but at No. 4 only for the auxiliary generator and at this same plant the main generator leads are force-cooled. Oil-pipe type was reported only for station No. 4. Segregated phase generator leads were reported by stations No. 2, 7, and 73.

Grounding is some 40% by resistance in the generator neutral. Two plants use reactance. Thirteen use distribution-type transformers with resistance in the secondary and three with reactance. Three others use potential transformers.

Excitation

Direct-connected exciters are the dominant practice (60 plants for both main and pilot). Eleven plants have only the main exciter on the unit shaft. Six report slow-speed motor-generator exciter units, one instance in conjunction with shaft units. One specifies high inertia. Two-bearing shaft exciters are reported by five plants, four at 375 v. Omission of a spare exciter is the practice at 30 plants but one (No. 67) carries spare armatures for main and pilot exciters. Motor-driven spares are more common practice (39 plants).

Rheostatic exciter field regulation is the scheme at 27 plants. Amplidynes and Rototrols are reported specifically at some 6 plants; plant No. 78 has both. Static network regulation is installed at 15 plants. Plant No. 10 reports electronic rectifiers fed from a shaft generator, high speed automatic anode breakers, voltage regulation by controlled firing of ignitrons in conjunction with electronic supply to exciter fields. A separate exciter for starting up is provided at plant No. 3. Plants No. 23 and 24 have spare excitation from battery (130 v) and motor-generator sets.

Control Room, Instrumentation

Centralization of control functions is a feature of 44 of the 82 stations tabulated. Two others mention only the boiler room. One (No. 3) has turbine, boiler and high-voltage switchboard all in the same room but there are 19 in which no transmission is included in the controls. Fourteen use benchboards for the mechanical controls. The operating room is housed between turbines and boilers in 37 instances but one (Plant No. 76) has a cubicle so located. The room is glass-enclosed in 14 plants, two of them partly so.

Air conditioning is provided in 31 plants and another (No. 11) circulates filtered air. Sound proofing helps the operators in 34 plants and in one only the ceiling is sound proofed (No. 15).

Boards are vertical duplex in 32 plants. Visual annunciator panels in 71 plants, flush-mounted instruments in 73 and comprehensive station communication in 63 indicate extensiveness of these practices.

Hourly log readings are obviated by printometers in 14 plants and frequency lights guide the operators in 8.

Control cables are run in troughs, trays or trenches in 56 plants, another has a tunnel and in still another the cables are in trays suspended from the Lucite ceiling.

In plant No. 18 the microphones are suspended from the ceiling. Relays in plant No. 1 are in a separate room. Plant No. 4 provides bearing temperature recorders. Plant No. 25 has retained separate control rooms for boilers and turbines. Plants No. 55A and 59 have mimic diagrams and miniature instruments.

Station Auxiliary Power

One plant (No. 4) adopted an air-cooled auxiliary shaft generator and another (No. 72) also has an air-cooled unit but not specified as shaft-driven. The general source is, however, an auxiliary transformer tapped off the generator leads (61 plants) or off the bus (1 plant). Twenty-two of the 61 say "off the generator or off the incoming bus" with 7 more that make the same entry and four that report "off the incoming bus"! Forty of the 61 using tapped generator leads have a reserve in a bus-tapped transformer. Another plant (No. 35) has an independent bank and No. 44 uses a tertiary winding in the main transformer.

Auxiliary sources are never parallel in 28 of the plants and another normally does not parallel during transfer. The changeover is automatic in three stations.

Air-cooled unit-type substations are the rule (39 plants plus 2 partly) for the step down. Three-phase transformers are also the rule either throughout (63 plants) or partly (2 plants) or in general (2).

Breakers are pneumatically operated in 13 plants while a fourteenth confines the operation to the 69-kv breakers. Air operation for the switchgear in the indoor substation is the practice in 13 plants with one reporting magnetic operation of the air breakers. A spare compressor is the practice in 8 plants and a common air supply for all breakers in 7.

Metal-clad air switchgear predominates (41 plants) for coal handling in the coal-using plants.

Partial information on station batteries indicates twelve with 250 v, four with 125 v and three with both.

Bypass disconnects on the auxiliaries' breakers are provided at stations No. 10, 12, 72 and 78. Number 2 has a nickel-cadmium battery. Auxiliaries in plants No. 3 and 7 are started from the station ties. Plant No. 76 has steam-turbine drives for the ID fans and boiler feed pumps. Plant No. 3 has sealed dry-type auxiliary transformers 13,800/440 and 13,800/208 v.

Operating Staffs

Response to the query ". . . . operators per shift for . . . . turbines" was exceedingly varied, ranging all the way from half a man to 11 men.

Analysis of the data gives the following index of manpower per turbine per shift:

Men	*Plants*	*Total Mw*
Up to 1	6	302
1+ to 2	9	656
2+ to 3	14	649
3+ to 4	14	880
4+ to 5	8	622
5+ to 6	4	320
7 to 11	2	71
		3,500

Great bulk of the 3,500 Mw is operated with 1 to 5 men per shift per turbine with an average of about 3.5 men.

Buses

Omission of circuit breakers of generator voltage was achieved at 44 plants. Metal enclosure for the bus is provided at 27 plants, 26 of which identify isolated phase and one (No. 7) segregated phase. Some overlap is found among the 17 that report phase segregation for the generator switchgear. There is one specifically reported ring bus (Plant No. 1).

Two-section bus arrangement prevails at 5 plants and a 3-section ring bus for auxiliaries at 5 others. High bus reactors are installed at 11 plants. Speed sectionalization of the auxiliary bus is fairly common (14 plants). Twelve plants refer to 440 v and two to 550 v and another (No. 78) on the 2.3 kv bus.

Double-bus switchyards are associated with 27 plants, 22 of them 66 kv, two 132 kv, two 110 kv and one 33 kv. Generators are divided between the 132 kv (plants No. 29 and 30) or 110 kv buses (plant No. 42). Plant No. 67 also reports a 115 kv main and transfer bus.

Outgoing Transformer Yard

Forced-air-cooled transformers are popular; of the 55 stations equipped with them there are 7 that also operate forced-oil. Stations No. 13, 14 and 25 have self-cooled units in addition.

Single-phase transformers prevail in 6 plants, one has single-phase breakers and 6 more have both. Nine plants have two transformers per generator and three have one. Nine plants have 3-winding transformers; for plant No. 62 the voltages are 13.8/69/138 and for No. 78, 6.6/-33/115. Twenty plants have welded-on covers for the main transformers. Protection is mulsifier at 19 and CO_2 at 2 plants.

Reduced rating arresters are installed at 9 plants.

Lighting

Continuous luminous ceilings were designed into 16 plant control rooms. Panels are lighted by totally indirect units in 10 plants; five others have control rooms with arched ceilings and cove lighting.

General station lighting is fluorescent in 20 plants and in another (No. 8) it is applied in conjunction with prismatic reflector-refractor units and 1/1 mercury-incandescent high bay units. The outdoor generators and boilers of 10 plants are flood lighted. Vertical panels are control-lens lighted in 17 plants with another applying it only in control room.

REPRINTS . . .

Of the Sixth Steam Station Cost Survey that appeared in ELECTRICAL WORLD of April 24, 1950 are available at a nominal fee upon request. Address:—ELECTRICAL WORLD, 330 W. 42nd St. New York, 18, N. Y.

ELECTRICAL WORLD'S STEAM STATION CHECK CHAR

Plant Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Number of Units	1	1	2	2	2	2	2	2	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2	2	1	2	2	1	2	2	2
Total Kw Rating	65	30	250	230	160	160	150	150	132	69	60	60	40	40	80	25	25	23	125	100	80	80	80	80	80	80	60	40	40	60	120	35	120	40	30	200	160	80
Geographical Area	NE	NE	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	WNC	WNC	WNC	EA	EA	EA
Initial Operation	11/49	11/48	1951	11/48	1950	12/48	1950	1949	3/49	6/48	10/49	1952	11/48	1950	48,50	10/47	6/48	2/49	1/50	1948	8/48	8/49	12/50	2/49	8/47	11/49	2/49	3/49	10/49	47,49	1949	1949	12/50	3/50	8/49	8/50	49,50	49,50
Steam Pressure	850	850	1500	1500	1450	1250	1450	1250	850	850	1250	1650	1250	1450	1250	875	1350	850	2000	850	1290	1380	1520	820	850	1250	850	850	1250	850	1250	650	1335	850	1250	1250	850	1250
Steam Temperature	900	900	1000	1050	1000F	925	1000F	950	900	875	950	1000F	950	1000F	950	910	1000	900	1050F	900	850	900	950	950	900	1000	900	900	950	900	950	825	955	900	950	950	925	950
General Features																																						
Single operating level												●				●	●		●															●					
Two-level operation	●			●			●	●	●	●	●		●	●		●		●		●	●	●	●	●	●	●	●	●						●		●	●	
Completely outdoor plant																																						
Horizontal scheme for plant				●						●		●			●			●			●	●	●				●	●					●			●	●	
O. D. plant, canopy over firing aisle																													●									
Minimized vol. for turbine room												●			●																							●	
Gantry crane services turbine																													●									●
Grating floors throughout	●	Part								●						Part											Part		●					Part				
Forced-air vent. entire plant				●				●				●						●	●	●				●					●		●		●					
Designed for quick load pickup						●			●			●						●	●	●									●									
Air preheater outdoors	●			●					●						●											●			●		●		●					●
Cath. prot. for pipes and conduits																																					●	
Pub. address network throughout	●			●	●	●		●	●	●	Temp		●	●		●	●		●	●				●	Part	Part		●										
Auto. cont. for system disturbances		●		●						●			●	●	●	●			●		●	●	●	●				●			●					●		
Fuel and Fuel Handling																																						
Primary fuel	C	C		G	C	C	C	C(Alt)	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Secondary fuel												G			O			G								G					G		G		G			
Fuel oil stored in buried tanks	Tgn						Tgn				Tgn							●	●																			
Drag-line for reclaiming											●																											
Earth-moving equipment	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				●	●	●	●	●	●			●	●	●	●	●	●	●
Loco. crane for piling and reclaiming		●				Part																																
Stiff-leg tower crane unloads barges				●											●	●									●													
Mine mouth coal supply						●																							●									
Drum-type hoists position barges		●		●											●	●			Note						●													
Hoppers accom. . . . cars simul.	1			1			1	2	4	●	2	2	2	2				2	1	1				2		1	2	2	1		1	1			1	2		1
Car-thawing pits (sheds)							●		●	●	●	●	●	●				●		●							●	●			Part		●	●				
Frozen coal thawed by. . .									Oil		Oil	Oil							Oil					Gas		Oil	Oil							NGas				
Car shaker-out	●							●	●		●	●						●		●							●	●							●		●	
Guill. blade breaks frozen mass										●				●	●																							
Belt and/or flight conveyor	BF	B				B		B	BF	B	B	B				B	B		B	BF				BF	B	B	B	BF	BF		BF	BF	BF	BF		BF	BF
Pulverizer under coal bunker	●			●	●	●			●	●	●	●	●	●	●	●	●	●	●	●				●	●	●	●	●	●				●			●	●	●
Ash Control and Disposal																																						
Dust collectors outdoors	●	●		●		●	●	●	●	●					●						●	●	●	●				●	●		●			●	●		●
Mechanical dust collectors				●	●		●	●	●		●	●			●			●	●		●	●	●	Scr		1	●	●	●		●	●	●	●	●	●	●	●
Electrostatic dust collectors	●	●	●	●		●	Fut	●	●	●			●	●	●	●	●							Scr			Fut										Fut	
Rectifiers for precipitators									Elec				Elec	Elec	Mech																							
Retractible soot blowers	●		●	●	●	Air	●	Seq'l	●	●	●	●		●	●	●	●		Telsc	●	●	●	●	●	●	●		●	●		●	●	●	●	●	●	●	●
Fly-ash cond. by dustless unloaders		●	●				●		●			●			●		●																				
Fly-ash ren. cont. from collectors						●		Seq'l	●		●								●										●			●						
Dry-bottom ash sto. to alt. weirs							●								Pneu			●	●					●		●	●											●
Condensing, Cooling Water																																						
Channel deepened							●																					●										
Recirculation provided	●					Part	●	●		●			●	●					●	●	●	●	●		●	●	●	Fut		●	●			●	●			●	●
Cir. pump at screen well	●	●		●		●	●				2		●	●	●	●																						●
Water chlor. for slime control	●			●	●		●	●	●	●	●	●						●	●	●				●	●	●	●	●	●		●	●		●		●	●	●
Deep wells (cooling, drinking)							●				O'K's	●							●	●								●										●
Ind. draft cooling towers																	●																				
Diff. head actuates screens					●		●	●		●	●				Alarm	●												Alarm			●		●					
Condenser																																						
Condenser outdoors																																						
Divided water box condenser		●	●	●	●	●		●							●										●	●												
Two-pass condensor to facil. cleaning							●	●		●	●		●	●		●		●		●								●				●	●			●	●	
Bypass for reverse flow in cond.							●			●	●					●			●	●																●		
Condenser tubed at factory							●			●	●	●				●	●															●						
Heaters in condensor throat				●	●			●			●	●		●										●			1					1						
Deaeration in condensor hot well		●		●	●			●	●		●	●	●	●	●	●				●	●	●	●	●				●				●				●		●
Deaeration for . . . ppm oxygen							30				30	30												5														
Measures for prev. leakage		●					●				●	●			●						●	●	●	●				●			●	●						
Min. condensate rate/g.		●			●		●	●	●	●	●	●			●	●					●	●	●	●				●			●	●	●					

Note: Diesel crawler crane unloads

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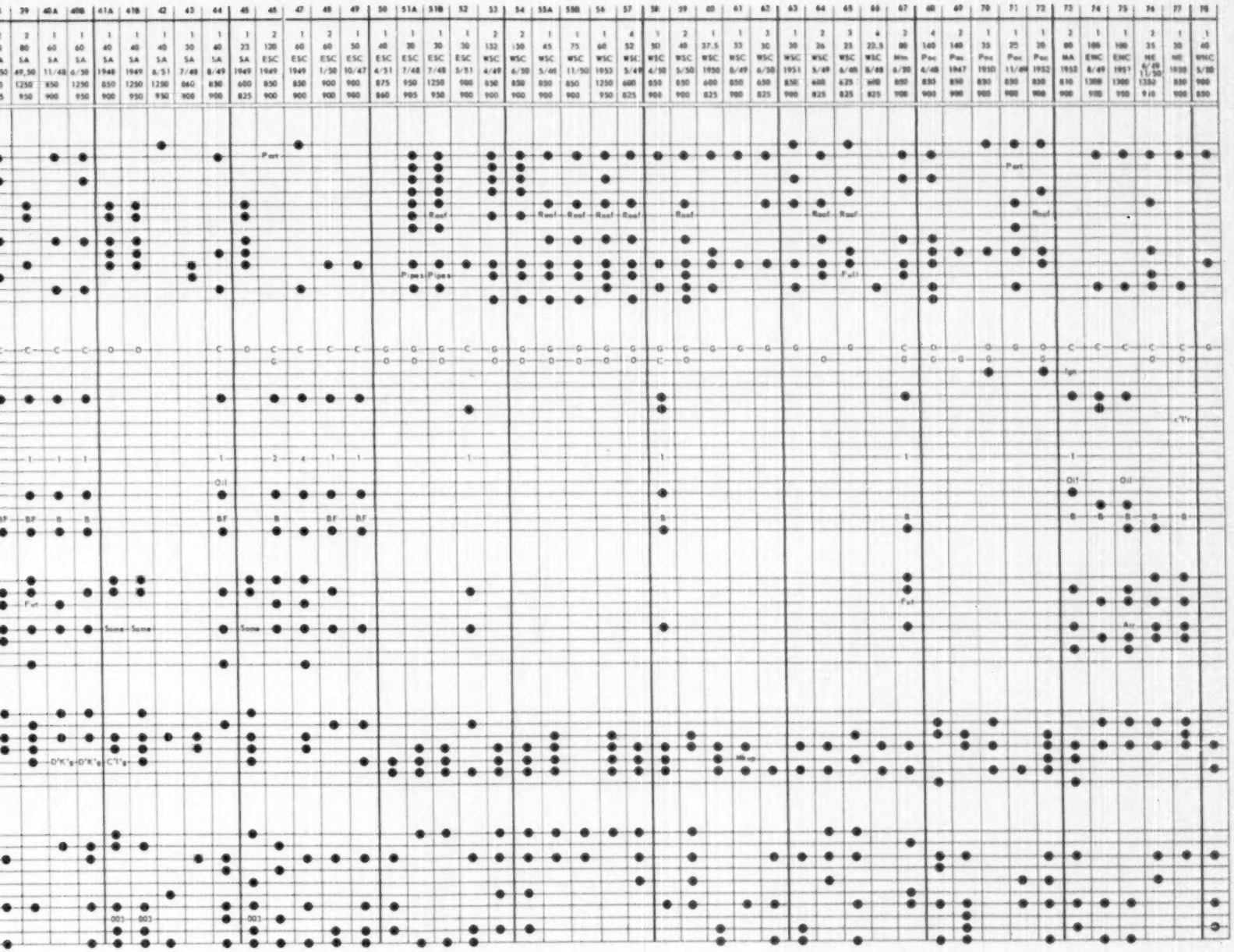
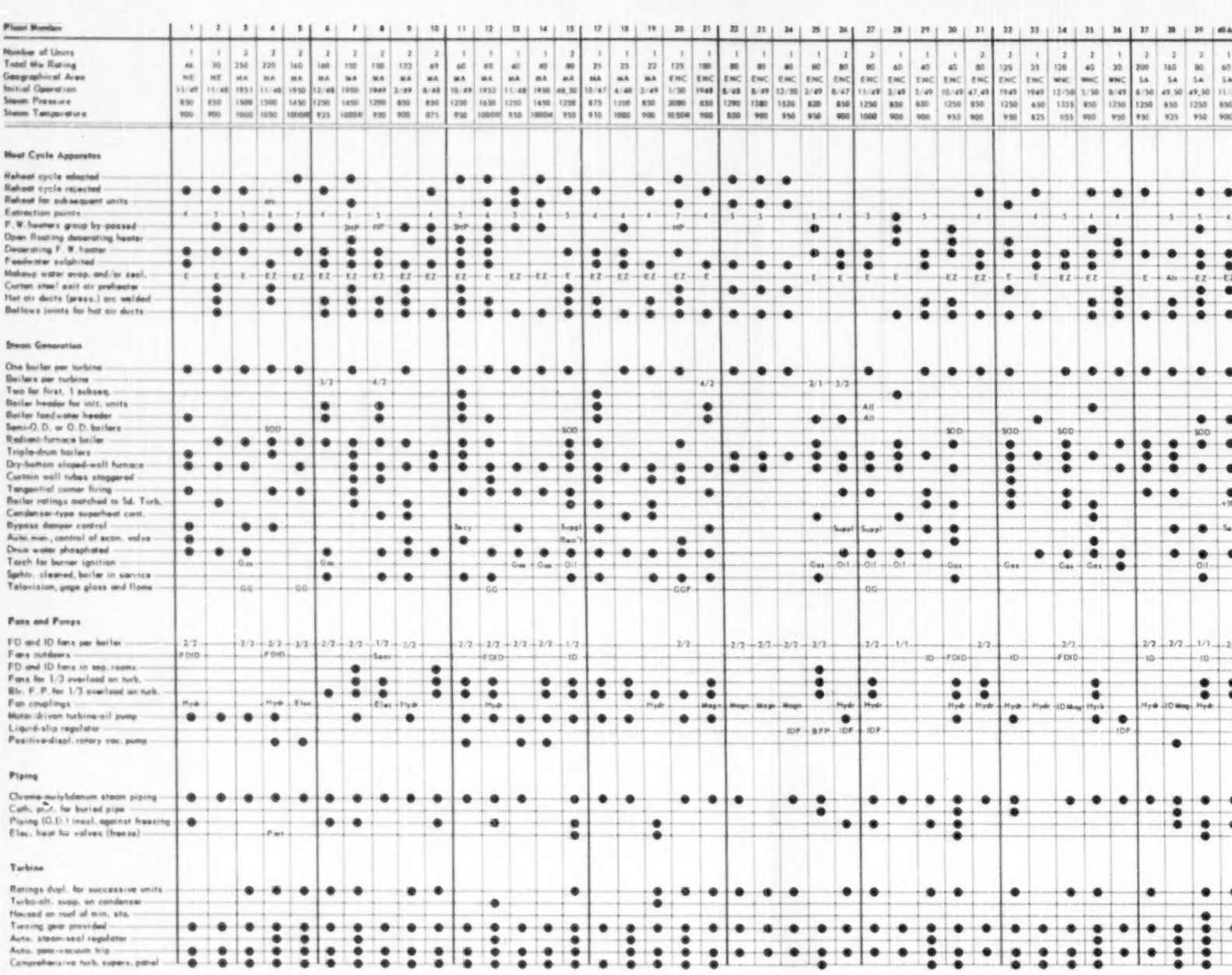
HART — Distinctive Features of 81 Post-War Plants

SHEET 1



For Key To Indentity of Plants See Sheet 4

ELECTRICAL WORLD'S STEAM STATION CHECK CHART —



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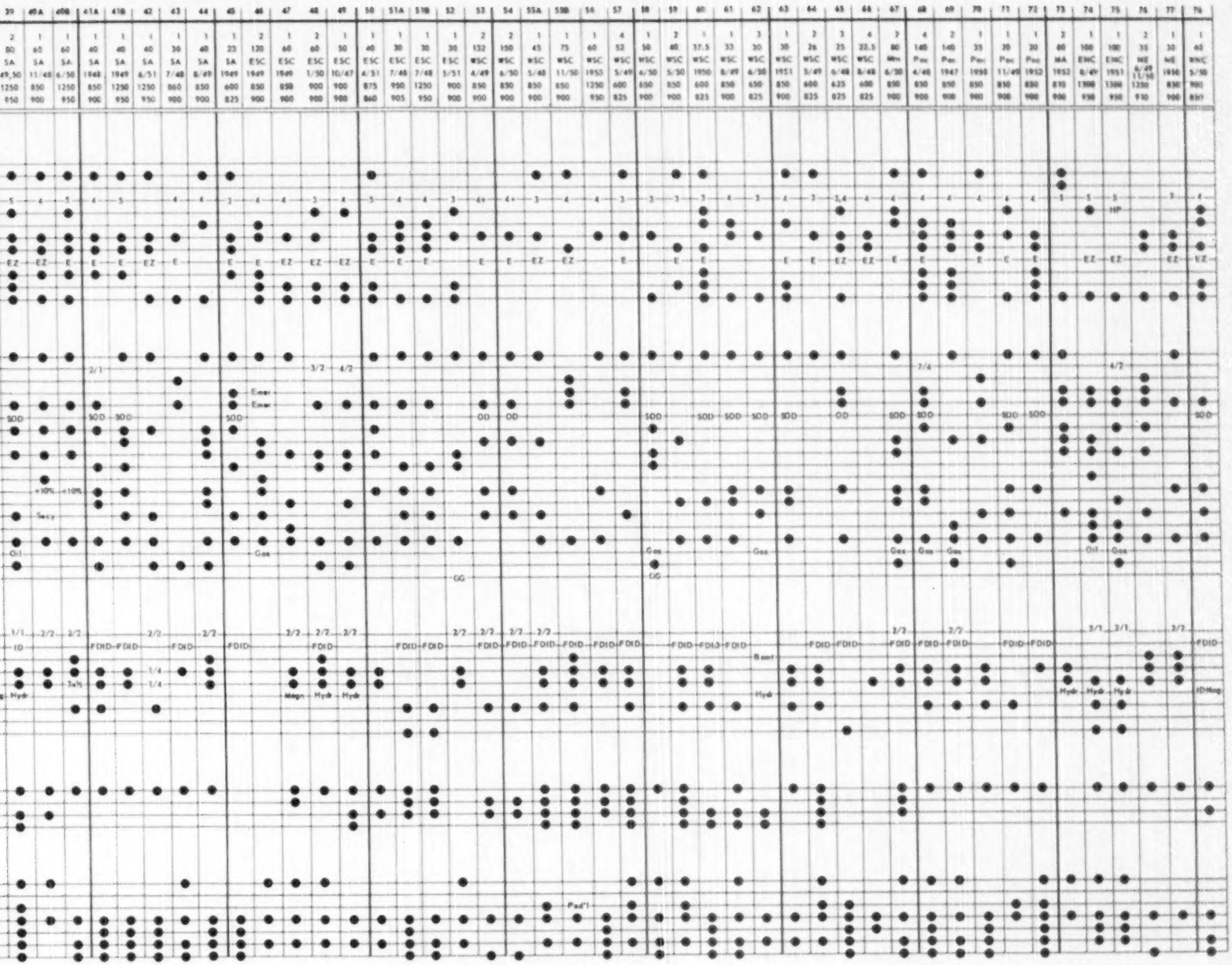
— Distinctive Features of 81 Post-War Plants



For Key To Indentity of Plants See Sheet 4

ELECTRICAL WORLD'S STEAM STATION CHECK CHA

Plant Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Number of Units	1	1	2	2	2	2	2	2	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2	2	1	2	2	1	2	2	2
Total Mw Rating	66	30	250	220	160	160	150	150	132	60	60	60	60	40	80	25	25	22	125	100	80	80	80	80	80	80	60	40	60	80	120	33	120	40	30	300	160	80
Geographical Area	NE	NE	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	ENC	WNC	WNC	WNC	SA	SA	SA
Initial Operation	11/49	11/48	1951	11/48	1950	12/48	1950	1949	3/49	8/48	10/49	1952	11/48	1950	48,50	10-47	4/48	2/49	1/50	1948	8/48	8/49	12/50	2/49	8/47	11/49	2/49	3/49	10/49	47,49	1949	1949	12/50	3/50	8/49	8/50	49,50	49,50
Steam Pressure	850	850	1500	1500	1450	1250	1450	1250	850	850	1250	1650	1250	1450	1250	875	1350	850	2000	850	1290	1380	1820	820	850	1250	850	850	1250	850	1210	450	1335	850	1250	1250	925	1250
Steam Temperature	900	900	1000	1050	1000F	925	1000F	950	900	875	950	1000F	950	1000F	950	910	1008	998	1050R	900	850	900	950	950	900	1000	908	900	950	950	950	825	955	980	995	950	925	950
Alternator																																						
Preferred standard rating		●				●			●		●	●	●		●			●									●	●	●		●	●	●	●			●	●
Transposed-bar stator winding		●	●		●	●													●															●				
Units paired for control				●									●	●					●																			
Hyd. cooling at 15/0.5 psi	●	●	●		●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hyd. cooling at 25 psi			●	25,30	●							●							●																			
Temperature detectors in stator coils	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Temperature recorder for rotor	●		●		●	●	●				●	●	●	●	●		●		●	●	●	●	●	●		●		●	●	●			●				●	
Hydrogen cooling water										Well														River				Lake	Well	Well		Well	Well			River		
Hydrogen cooled by condensers		●		●	●			●				●	●	●	Circ	●	●	●	●			●	●			●		●		●				●				
Connected dir. to transformer			●	●	●	Pen		●	●			●	●	●	●			●	●	●				●	●	●		●		●				●	●	●	●	
Short generator leads	●		●		●		●		●		●	●	●	●					●							●					●		●	●			●	
Isol. phase gen. leads	●			Nat Cl	Aux O						●	●				●																						
Start. coolers for H in stator shell		●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●		●	●	●	●	●
Grounding of generator neutral	R	R	Tx	TR		TR	Tx	PT	R	R	TR	R				R	R	R	R	R	R	R	R	TR	R	R		TR					Tx		TR			
Excitation System																																						
Direct-connected exciters	M&P	M&P	M&P		M	M&P	M		M&P	M&P	M&P	M&P	M&P	M&P	M		M&P		M	M&P	M&P	M&P	M&P	M&P	M&P	M&P	M&P		M&P	M&P		M&P	M&P	M&P	M&P	M&P	M&P	M&P
Slow speed mot.-gen. exciters				●			●					●						Mtn										●			●						
Two-bearing shaft exciter					275V	275V										275V																		230V				
No spare exciter	●		●												●		●			●	●	●	●				●	●	●				●		●			
Spare exciter, motor driven		●		●	●	●	●	●	●		Adj'ble	●	●	●		●		●	●					●	●		●	●	●	●	●			●			●	
Three-field exc. (self, rotary, batt.)				●		●							S&B	S&B																●			Ampl					
Rheostatic exciter field reg.		●	●				Man		●		●		●	●	●	●	●	●	●	●	●	●	●	●			●	●	●		●	●				●	
Rotating-type gen. voltage reg.	●			●	●	●	●							●	●				●	●					●				●				●		Ampl		●	
Static network reg. for exc.				●		●											●		●										●									
Control Room, Instrumentation																																						
Centralized control		●	●	●	●	●	●	●		●		●			●		●	●	●							●		●	●		●	●	●			●	
Oper. room between turb. and boilers		●		●	●	●	●	●		●		●			●		●	●								●		●	●		●		●			●	
Benchboard for mech. contr.			●			●						●						●			●	●	●															
Glass enclosed control room		●		●						●	●	●								●								●			●		Part					
Sta. contr. handles transmission?		No				No	No	No		No							No		No								Yes							No			
Control room air-conditioned				●	●	●	●	●		●	Filt				●		●		●						●	●												
Oper. can see turbo-alt.		●		●	●	●	●		●	●	●	●	●	●						●				●			●	●		●		●	●				●	
Sound-proofed control room	●	●		●	●	●	●	●		●	●	●			C'T's		●		●														Part					
Vertical duplex switchboard		●	●		●			●	●		●																										
Printometers obviate hourly rdgs.						●		●				●					●		●																			
Frequency lights guide operators			●			●						●							●															●				
Pushbutton reset of tripping relays					●	●		●			●	●			●		●		Turb					●				●										
Visual annunciator panels	●	●	●	●	●	●	●	●	●		●	●	●	●	●		●	●	●	●	●	●	●		●	●		●	●	●	●	●	●				●	
Comprehensive station communication	●		●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●				●	●	●	●	●	●	●	●	●	●	●			●	
Carrier current telephone	●			Exec		●				●		●						●	●	●				●	●	●	●	●	●	●	●	●	●	●			●	
Flush-mounted instruments on panels	●	●	●	●	●	●	●	●	●	●	●	●	●	Sup	●	●	●	●	●	●				●	●	●	●	●	●	●	●	●	●	●			●	
Control cables in open trough or trench			●	●	●	●	●	●	●	●	●	●		Sup	●	●	●		●	●	●	●	●	●	●	●		●				●	●					Tray
Station Auxiliary Power																																						
Shaft-generator for auxiliaries				●																																		
Aux. transf. off gen. leads			●		●	●	●	●	●		Bus	●			●			●	●	●	●	●	●	●				●			●	●	●		●	●	●	
Res. for aux. by bus-tapped transf.		●		●	●			●	●		●	●			●			●	●	●	●	●	●	●				●			●	●	●	Brnk		●	●	
Aux. off gen. or incoming bus	Bus			●	●	●		●		●	●	●	Bus	Bus	●		Bus		●									●			●							
Unit-type substa. for aux. (Air Cooled			AC	AC	AC	AC		AC	AC	AC	AC	AC	Pen	Pen						AC								AC			AC	AC				AC	AC	AC
Askarel transf. for . . . . v aux.	480V	●					600V				2300 220																											
Pheum. oper. breakers throughout sta.					●					●										●					●					●						69kv	
Air-oper. switchgear for indoor sub.			●				●			●	Hg Op					●	●													●			●					
Three-phase transf. throughout	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●				●		Gen'l	●	●		●	●		●	●	●	●	●	●
Two air comp. (one spare) for breakers						●	●			●	15.8kv					●				●																		
Common air supply all sta. bkrs.			●				●			●						●																					
Metal-clad air swgr. for cool handling	●			●	●	●	●	●		●				●	●	●		●	●	●	●	●	●	●	●	●		●			●	●	●	●	●	●	●	
Aux. sources never paralled				●			●					●						●																				
Ground det. on delta sys. system	●	●		●	●	●	●				●				●		●	●	●		●	●															

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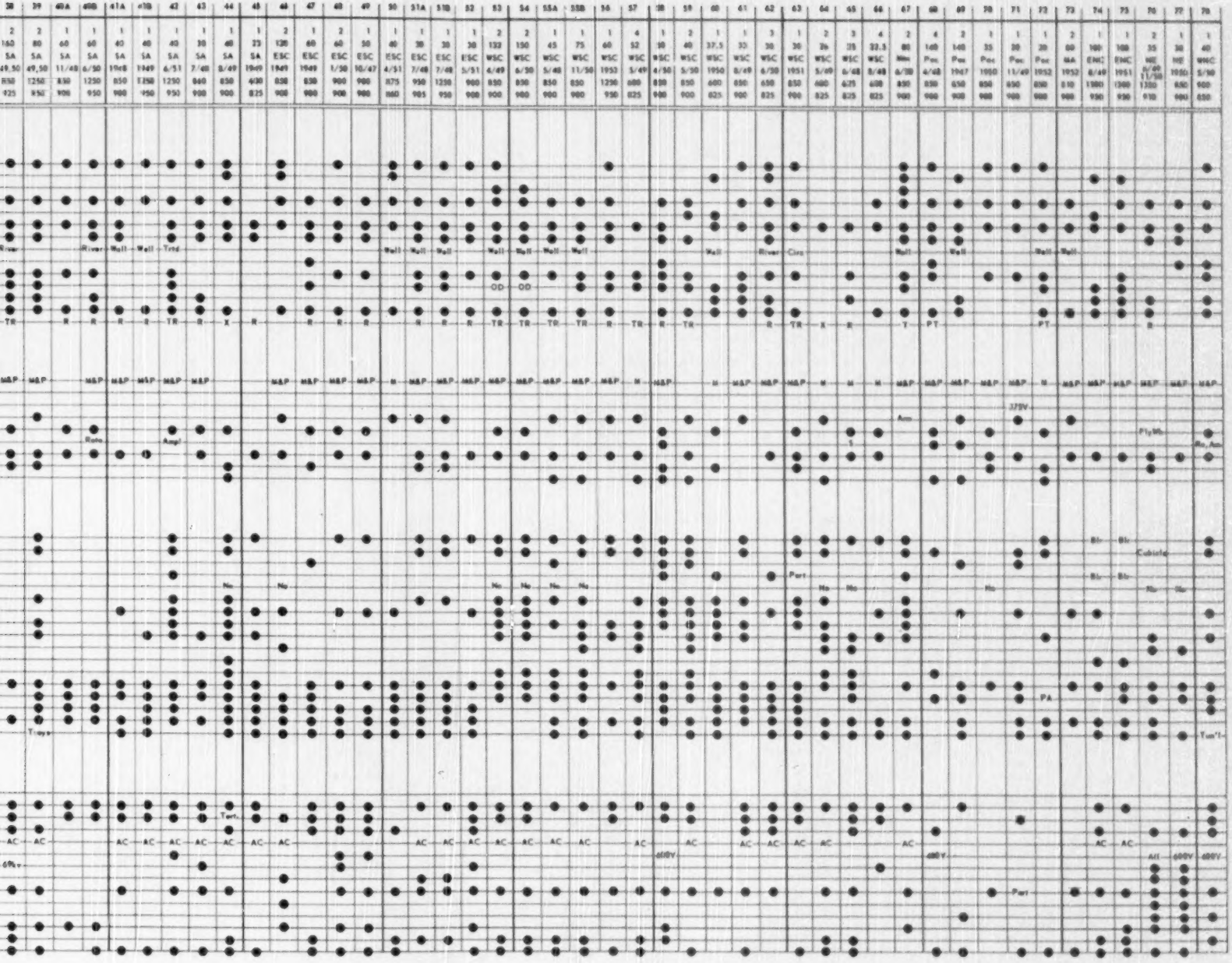
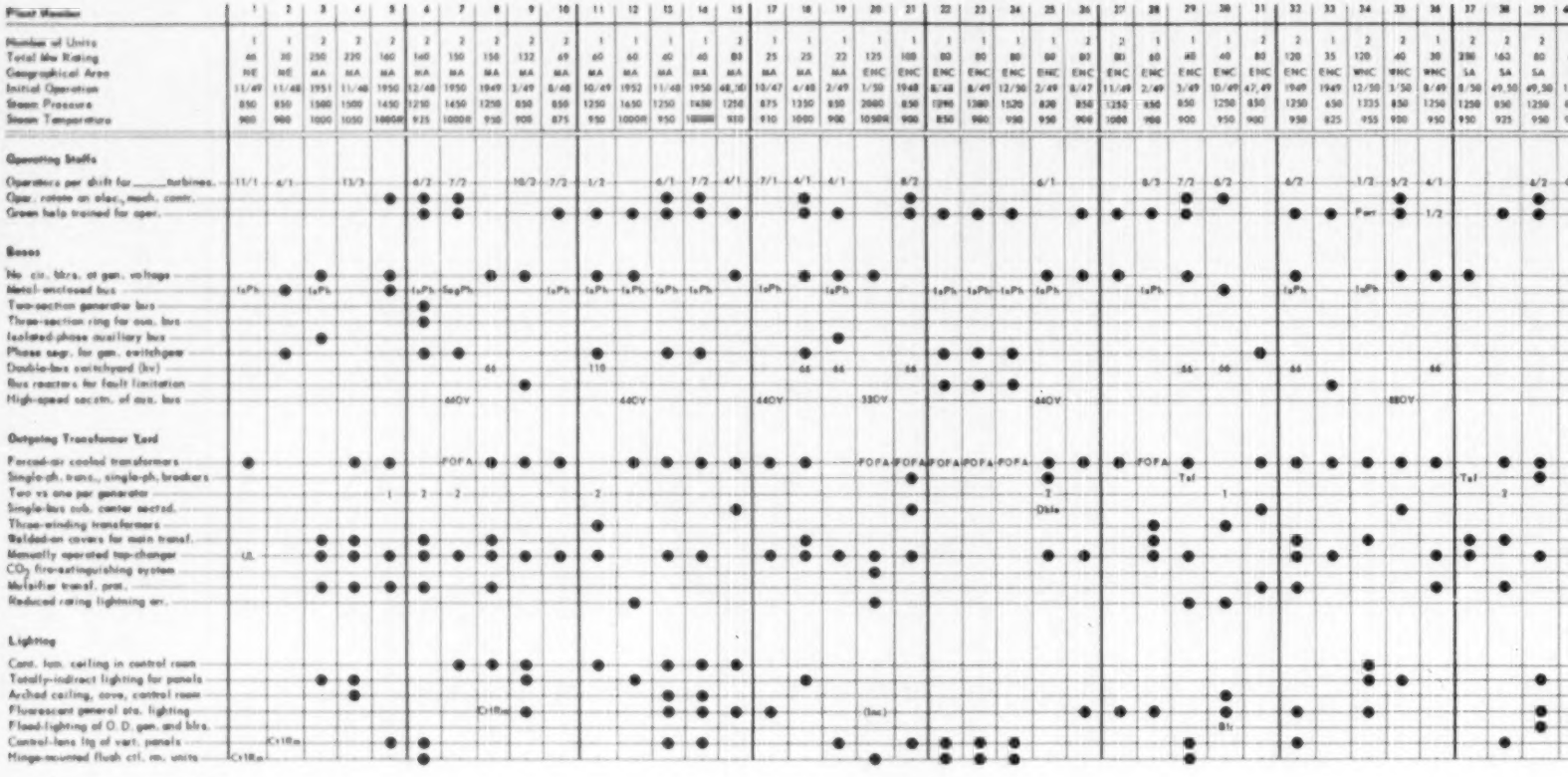
CHART — Distinctive Features of 81 Post-War Plants



For Key To Industry of Plants See Sheet 4

ELECTRICAL WORLD'S STEAM STATION CHECK CHART –



* Includes two 15 Mw units in old station

KEY TO IDENTIFICATION OF PLANTS

No.	Utility	Plant Name
1.	Western Massachusetts Electric Co	West Springfield
2.	The United Illuminating Co	English
3.	Consolidated Edison Co. of New York Inc	East River
4.	Public Service Electric & Gas Co.	Sewaren
5.	Niagara Mohawk Power Corp	Dunkirk
6.	West Penn Power Co	Mitchell
7.	Metropolitan Edison Co	Titus
8.	Pennsylvania Power & Light Co	Sunbury
9.	Philadelphia Electric Co	Barbadoes
10.	Pennsylvania Electric Co	Warren
11.	New Jersey Power & Light Co	Gilbert
12.	Central Hudson Gas & Electric Corp	Danskammer
13.	Rochester Gas & Electric Corp	Russell (No. 1)
14.	Rochester Gas & Electric Corp	Russell (No. 2)
15.	Long Island Lighting Co	Port Jefferson
17.	Staten Island Edison Corp	Arthur Kill
18.	The Scranton Electric Co	Suburban (No. 7)
19.	Rockland Light & Power Co	Hudson
20.	Central Operating Co	Philip Sporn
21.	Central Illinois Public Service Co	Meredosia
22.	Wisconsin Electric Power Co	Port Washington (No. 3)
23.	Wisconsin Electric Power Co	Port Washington (No. 4)
24.	Wisconsin Electric Power Co	Port Washington (No. 5)
25.	The Toledo Edison Co	Acme
26.	Illinois Power Co	Havana
27.	Illinois Power Co	Wood River
28.	Ohio Public Service Co	Edgewater
29.	Indianapolis Power & Light Co	White River
30.	Columbus & Southern Ohio Electric Co	E. M. Poston
31.	Wisconsin Public Service Corp.	Pulliam (Nos. 4 & 5)
32.	The Dayton Power & Light Co	O. H. Hutchings
33.	Lake Superior District Power Co	Bay Front
34.	Kansas City Power & Light Co	Hawthorn
35.	Iowa Electric Light & Power Co and Rural Electrification Administration	
36.	Omaha Public Power District	
37.	Georgia Power Co	
38.	Potomac Electric Power Co	
39.	Carolina Power & Light Co	
40.A	Virginia Electric & Power Co	
40.B	Virginia Electric & Power Co	
41.A	Florida Power & Light Co	
41.B	Florida Power & Light Co	
42.	Florida Power Corp	
43.	Tampa Electric Co	
44.	The Potomac Edison Co	
45.	Florida Power & Light Co	
46.	Alabama Power Co	
47.	Louisville Gas & Electric Co	
48.	Kentucky Utilities Co	

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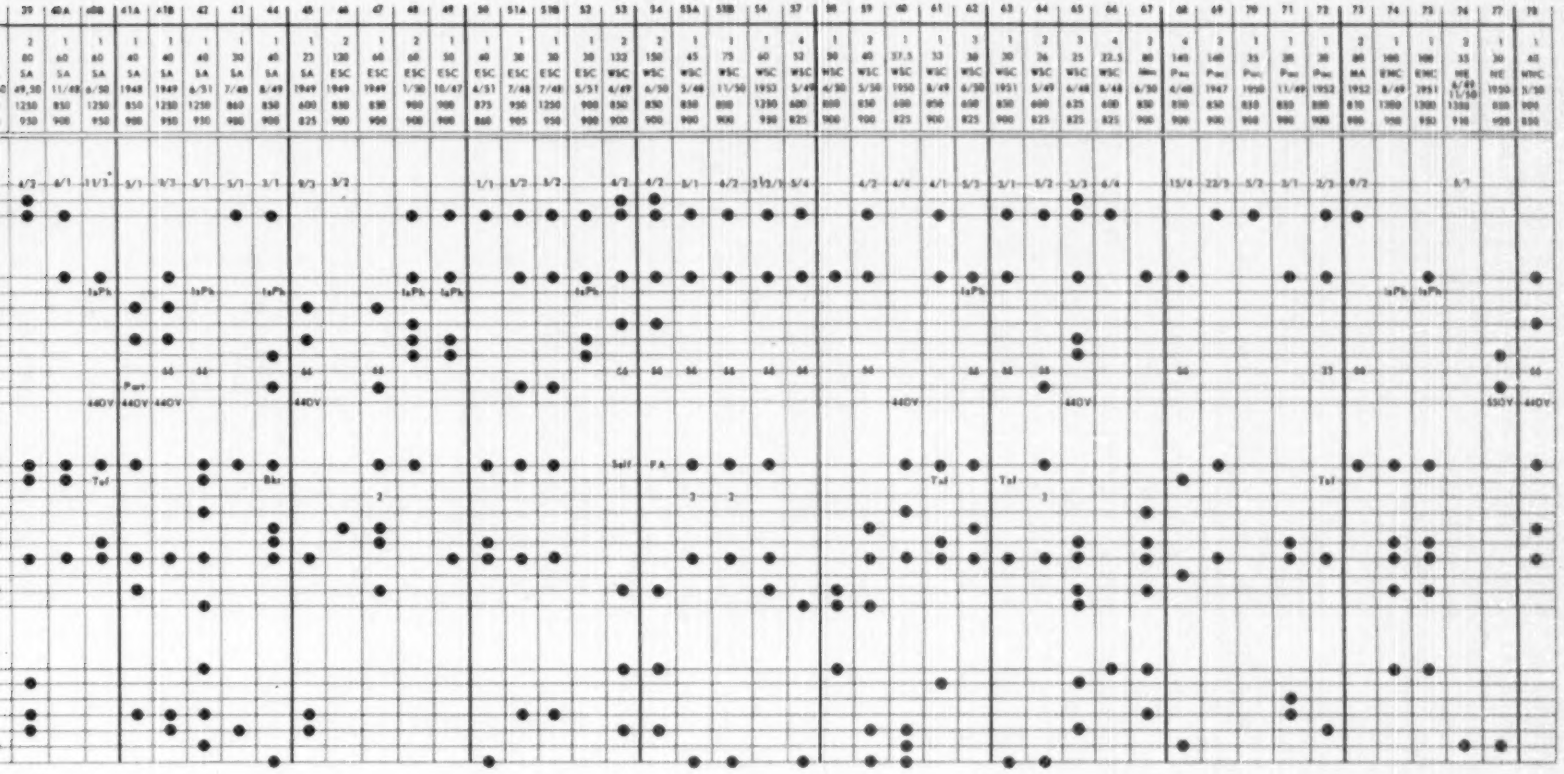
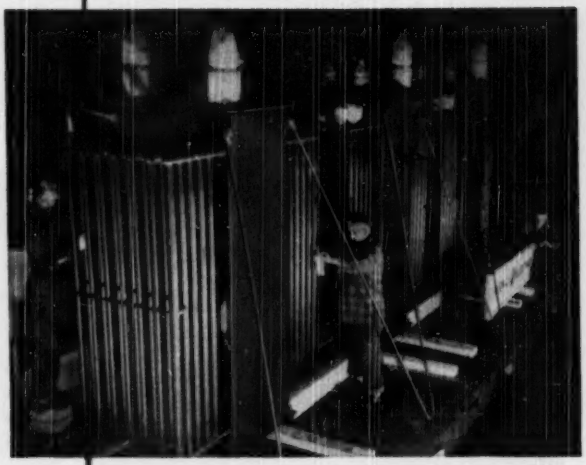


PLANTS INCLUDED IN CHECK CHART

	Plant Name	No.	Utility	Plant Name	No.	Utility	Plant Name
wer Co and Rural inistration	Prairie Creek	49.	Kentucky Utilities Co	Tyrone	64.	Texas Electric Service Co	Wichita Falls
vice		50.	Mississippi Power Co	Plant Sweatt	65.	Central Louisiana Electric Co	Coughlin
	Jones Street	51.A	Mississippi Power & Light Co	Rex Brown	66.	West Texas Utilities Co	Abilene
	Plant Yates	51.B	Mississippi Power & Light Co	Rex Brown	67.	Public Service Co of Colorado	Arapahoe
Co	Potomac River	52.	Kentucky Utilities Co	Pineville (Add'n)	68.	Southern California Edison Co	Redondo
Co	Lumberton	53.	Houston Light & Power Co	Greens Bayou	69.	Los Angeles Department of Water & Power	Harbor
r Co	Possum Point	54.	Houston Lighting & Power Co	West Junction	70.	City of Pasadena	Municipal Light & Power
r Co	Bremo	55.A	Texas Electric Service Co	New Handley	71.	City of Burbank	Burbank
	Miami (H.P. Ext.)	55.B	Texas Electric Service Co	New Handley (Ext'n)	72.	Glendale Public Service Dept	Glendale
	Cutler (HP)	56.	Dallas Light & Power Co	Parkdale	73.	Pennsylvania Power Co	New Castle (Add'n)
		57.	Texas Electric Service Co	Permian Basin	74.	The Detroit Edison Co	Trenton Channel
	Hookers Point	58.	Oklahoma Gas & Electric Co	Mustang	75.	The Detroit Edison Co	Connors Creek
	Riverton	59.	Texas Electric Service Co	Morgan Creek	76.	Cambridge Electric Light Co	Kendall Square
	Cutler (LP)	60.	Southwestern Public Service Co	Amarillo (East)	77.	New Bedford Gas & Edison Light Co	Cannon Street
	Gadsden	61.	San Antonio Public Service Board	Leon Creek	78.	The Kansas Power & Light Co	Hutchinson No. 2
Co	Paddys Run	62.	Public Service Co of Oklahoma	Weleetka			
	Green River	63.	Central Power & Light Co	Laredo			

$1350.00 Saved! on 3 transformers by purchasing RM*



* RM means "Repetitive Manufacture"—a type designation covering G-E power transformers with standardized construction and preferred-listed ratings up to 10,000 kva and 69 kv. This effective standardization, sensibly flexible with optional features, gives you lower cost and faster shipments.

THIS ACTUALLY HAPPENED!

Purchaser asked for quotation on these transformers:

3 transformers, 1000 kva each
Primary—22.7 kv
Taps—4 above primary, in 600-volt steps
Impedance—6%
Oversize bushings

Our quotation:

Shipment—13 weeks
Price—$12,807 net

We also quoted on RM-standard transformers as an alternate:

3 transformers, 1000 kva each
Primary—22.7 kv., an optional RM voltage
Taps—4 above primary, in 2½% (568-volt) steps
Impedance—5½%
Oversize bushings—an RM option included in price.

Our alternate quotation:

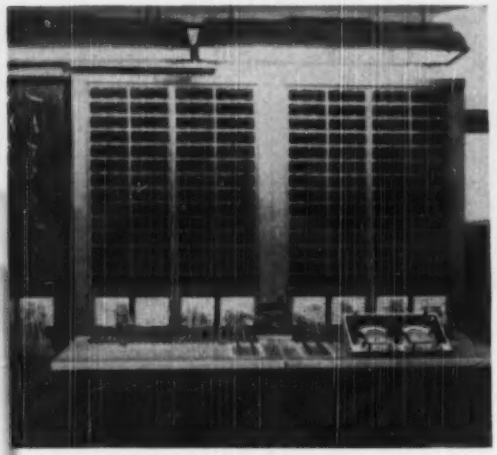
Shipment—6 weeks
Price—$11,457 net

Purchaser bought RM. Complete shipment actually made in five weeks. He saved 8 weeks in delivery, more than 10% in cost.

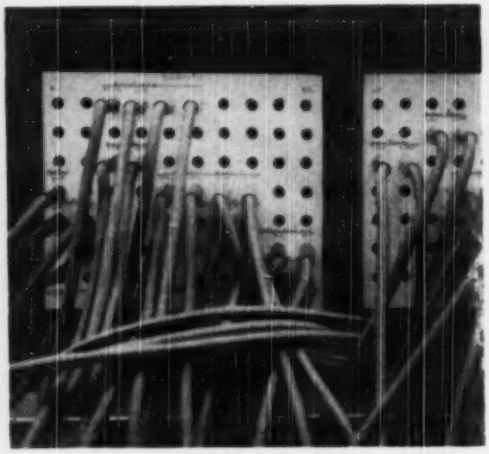
Ask for catalog GEC-479. Apparatus Department, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN



CONNECTION PANELS with templates save 13 hr when entire transmission system is set up on board. Each box is connected in 1/8 the time formerly needed for set up made from reactance diagram



TEMPLATES cut from 36-lb bond paper are marked with cord numbers directly above each jack, equipment designation above cord number, and system location above each group of equipment jacks

Templates Cut Setting-Up Time of Calculating Board

W. W. WARE
Philadelphia Electric Co
Philadelphia

COMPLICATED recurring network problems for the dc calculating board need no longer be rejected or delayed because of the time consumed in setting up the problem and later returning the original system-wide setup to the board. Using templates marked for the existing system, Philadelphia Electric Co can set up about 225 boxes, which represent its entire transmission system, in less than 2 hr—a saving of 13 hr over previous methods. In addition, to cut the setting-up time of problems regarding future system arrangements, the company has made templates for those problems which recur most frequently.

The template consists of 36-lb bond paper cut to fit a section of the connection panel, with holes coinciding with the jacks of the panel. These holes are large enough to pass the shank, but not the shoulder, of the plug. When two or more plugs are inserted into the jacks, the shoulder of the plugs will hold the template securely in position.

The number on each cord used initially to set up the calculating board is marked on the template above that cord. Since each box has two cords (red and green) with the same number, the cord numbers on the templates are marked in corresponding red or green color.

Designation of equipment represented by the box is made at each hole, in addition to box numbers. Each group of two or more adjacent plugs on the panel represents a point or bus on the system. Designation for this point or bus appears above corresponding holes on the template. Each template is marked to show the section of the connection panel on which it is to be used (see illustration).

The problem name or number is marked on each template to prevent mixing templates for different problems. Other pertinent information, such as which relay bus jacks are in use and why, is also indicated on the templates.

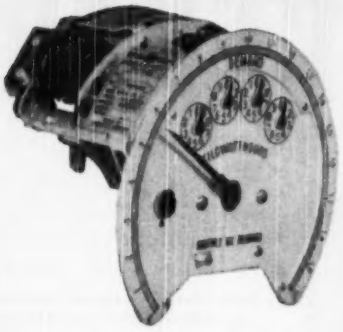
Box settings are facilitated by preparing a sheet showing box numbers and settings for each set of templates. This sheet also bears the identifying name or number of the associated templates.

Service Drop Cable Looks Good; Costs Less

H. A. ENOS
Chief Distribution Engineer
American Gas & Electric Service Corp
New York

BLACK POLYETHYLENE insulation and aluminum conductors have been combined in a twisted service drop cable which saves about 52% over

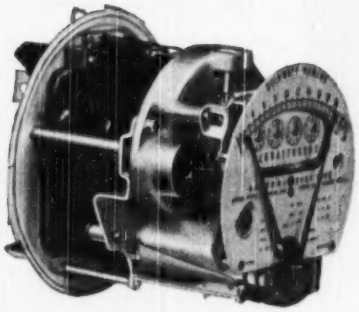
FOR MEASUREMENT OF *Small Demands*



TYPE M-30—DEMAND REGISTER

- M-30 *mechanical-type register* (for mounting on a watthour meter)—measures kilowatt demand.
- Demand register can be substituted for conventional register on many types of watthour meters and totalizing relays
- Positive reset
- Simple adjustments
- Minimum number of parts
- Moderate price, low installation cost.

Ask for publication GEC-413.



TYPE IHM—WATTHOUR DEMAND METER

- IHM *thermal-type meter* does the work of two meters—measures both kilowatt-hours and kilowatt demand
- "Direct-heat" principle produces high torque, permits large, sturdy parts
- Sustained accuracy at high and low loads
- No overshoot on transient loads
- Short testing time
- Low installation cost.

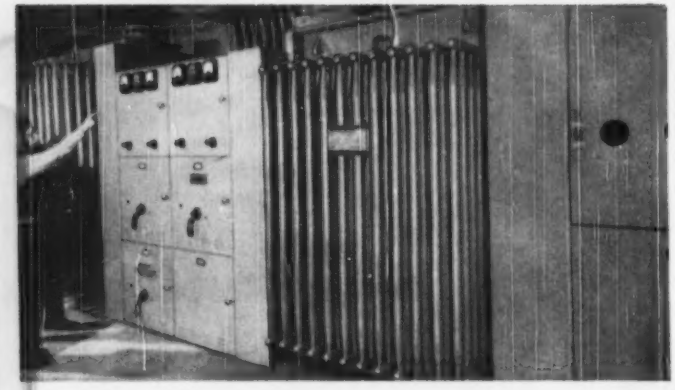
Ask for publication GEC-408.

General Electric's complete metering service can help you in two ways—by providing everything you need in metering service; by helping you apply it for proper results. Get in touch with your G-E representative for product and application assistance —now. Apparatus Department, General Electric Company, Schenectady 5, New York.

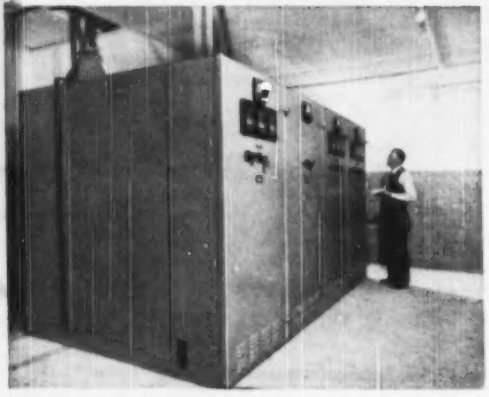
GENERAL ELECTRIC

Scott GETS RELIABILITY

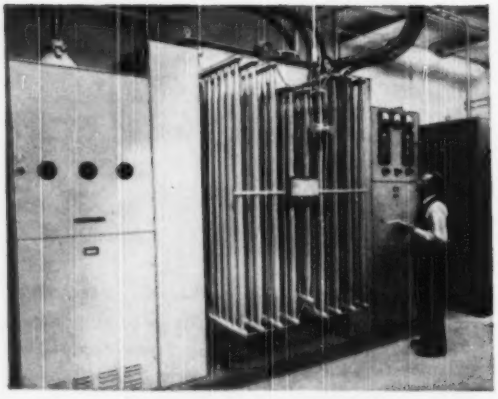
G-E LOAD-CENTER



Double-ended load-center unit substation with 1500 and 1000 kva transformers. This unit receives incoming power at 13.2 kv and distributes it at 600 volts to steam plant auxiliaries and finishing equipment. Blades of air interrupter switch (right) are clearly visible through window, another safety feature of G-E unit substations.



R. E. Neilson, Electrical Superintendent of Marinette Paper Co., looks over the G-E 15-kv metal-clad switchgear that handles the 13.2 kv incoming power through three Magne-blast power circuit breakers. Metal-clad switchgear is neat in appearance, saving in space, and offers operating safety to personnel. Additional sections can be added for future expansion with a minimum of bother and expense.



General Electric 1500 kva load-center unit substation that supplies power to No. 4 paper machine. Air interrupter switch on the primary is easy to operate, blades are easy to see. Air circuit breakers on the low-voltage side are rated 1600 amperes, have plenty of "IC" (Interrupting Capacity) to handle all short circuits. Note entire load center is metal-enclosed, thus offering operating safety to personnel.

PLUS FLEXIBILITY WITH ···

UNIT SUBSTATIONS

"We can't afford to take chances with an inadequate power system because a breakdown would mean a major loss in both production and time. Our General Electric power-distribution system gives us the reliability and flexibility we need. If there should be a major fault we'd still be able to operate at slightly reduced capacity.

"The installation of this equipment was made without any trouble and we quickly changed over from our old system on a three-day weekend."

R. E. Neilson, Electrical Superintendent
Marinette Paper Co. (subsidiary of Scott Paper Co.)
Ft. Edward, New York

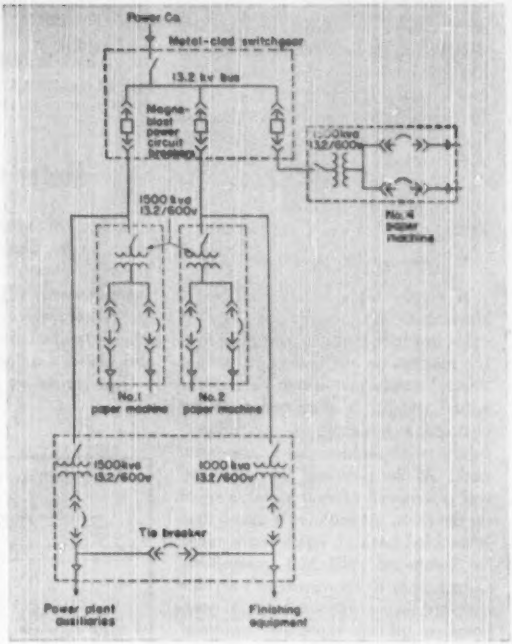
CHECK THESE FEATURES OF G-E LOAD CENTERS . . .

SAVE TIME by eliminating weeks spent over drawing boards detailing individual items. G-E factory-assembled unit substations are quickly and easily installed with lower material and labor costs than required for "piece-meal," makeshift affairs. No last minute "alterations" with hacksaws and cold chisels when you order G-E unit substations.

NEAT APPEARANCE Note the smooth, integrated appearance of these G-E unit substations . . . no more gawky, "old style" stovepipe connections between transformer and switchgear.

INVESTIGATE TODAY how General Electric unit substations can be used in your plant for efficient, flexible power distribution. Contact your G-E sales representative for further information, and write today for the helpful bulletins listed below. *Apparatus Department, General Electric Company, Schenectady 5, New York.*

GEA-3592 Load-center Unit Substations
GEA-3758 Load-center Power Distribution
GEA-3083 Metal-clad Switchgear



Here's the one-line diagram for Marinette Paper's Ft. Edward installation. The tie breaker on the double-ended unit substation makes it possible to shift the power supply in case of a primary fault, thus assuring continuous production at reduced capacity.

Metal-clad switchgear distributes the 13.2 kv incoming power to four G-E load-center unit substations where the high voltage is stepped down to 600 volts for utilization—right at the center of the load area. This eliminates long, costly secondary feeders.

The Scott installation is a complete General Electric project—one source of responsibility plus the very best in co-ordinated planning, engineering, manufacturing, and service facilities to give maximum savings and efficiency to the customer.

Be sure to see the "More Power to America" full-color sound slide-film "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.

GENERAL ELECTRIC

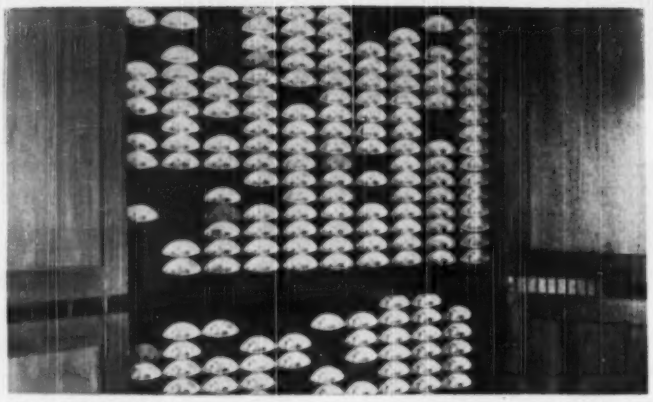
all older types of cable. Furthermore, this cable costs no more in place than three open wire conductors of the same size and kind with any type of covering. Other advantages of this combination include: (1) Its light weight which permits installation and sagging-in by one man; and (2) improved appearance.

A sharp reduction in the cost of black polyethylene in the past two years prompted an investigation of its possibilities as insulation on three-conductor twisted cable with bare neutral. Polyethylene, as compared with rubber or Neoprene, has extremely high dielectric strength. It has greater resistance to deformation and a much higher insulating value. Its characteristics permit a relatively thin layer of insulation as compared with other available coverings. Cables covered with polyethylene, of course, must be handled as carefully as any other insulated cables.

Manner of Installation

A considerable amount of No. 4 aluminum three-conductor twisted cable has been installed in the following manner on our system. The bare neutral conductor, which carries the entire weight, is dead-ended at the customer's building on one all-porcelain wire holder or a one-point rack. At the pole end the bare neutral is wrapped around an extra spool on the rack. At both ends the neutral is doubled back on itself and secured by means of split bolt connectors. Connections to the customer's service entrance cable are made with compression splices, especially designed for aluminum conductors. At the pole end the service conductors are connected to the secondary by means of split bolt connectors.

We have had some of this cable installed about two years with no insulation failures. While 2/64 to 3/64-in. thickness of polyethylene has much more than enough dielectric strength, some doubt existed as to whether sufficient thickness would be maintained because of the possibility of cold flow under compression stress on the insulation developed in service. Careful tests comparing twisted cable with the spiral type, with the neutral under tension, determined that in the spiral type the insulation broke down electrically at a very much lower value than in the twisted type.



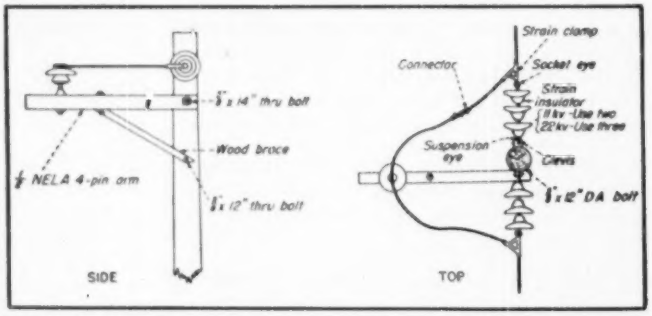
METER GEAR TRAINS hung on pins in cabinet permit quick removal when industrial meter constants must be changed. One cabinet for each make of meter allows visual inventory

Meter Gears Stored for Rapid Withdrawal

SYSTEMATIC STORAGE of meter gear trains, at the Worcester office of New England Power Co, means quick changes when differences in constants are called for in industrial plants or other large installations. This practice also allows a quick visual inventory.

Gear trains are housed in cabinets which are adapted to different meter makes. Units are hung on pins which fit holes in gear train plates, with plates faced out to display gear ratios.

In the cabinet illustrated, lower section holds 190 high-ratio trains, upper section 160 low-ratio trains. Pigeonholes are at top for spare parts.



DEAD-END TERMINAL for long spans on 22-kv lines uses a minimum of component parts and provides adequate clearances. Illustrated is installation for only one of three phases

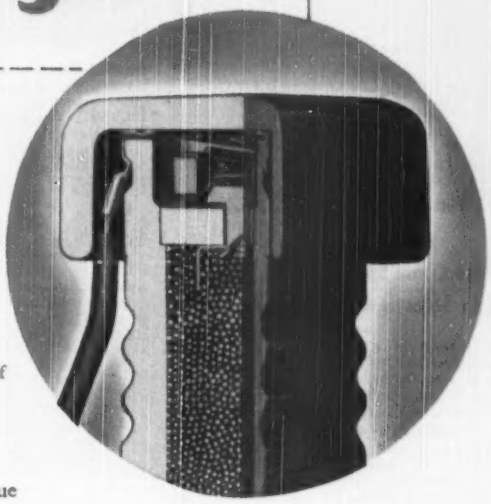
Simplified Dead-Ending for Long 22-Kv Span

USING a single pole and half-cross-arm with three strain insulators per phase, Hartford Electric Light Co has simplified 22-kv long-span dead-ends. By locating a pin type insulator near the outer end of the arm and looping a jumper through it, maximum flexibility is attained. Installation is aided by using a connector on one side of the loop.

Carrying the loop away from the pole top gives more clearance for linemen working on the pole. This construction is also used on 11-kv long spans, but with two strain insulators per phase instead of three.

Sealed-in Nitrogen

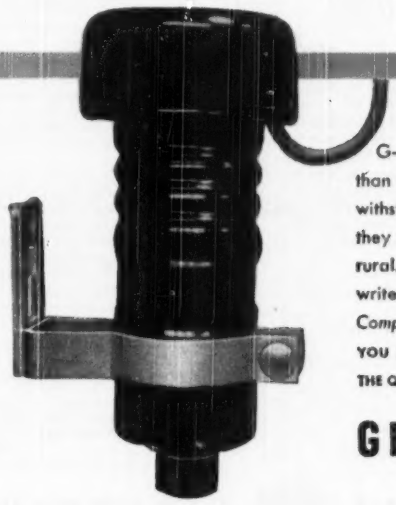
—one big reason why users prefer Pellet Arresters



Section of 3-kv pellet arrester, showing sealed N_2-filled gap chamber containing the series gap elements.

The G-E Pellet Arrester is the *only* distribution lightning arrester made today with dry nitrogen (N_2) sealed in the gap chamber. It's an *exclusive* G-E feature and your assurance of greater reliability over more years of operation. By preventing the formation of ozones and oxides, the dry, inert nitrogen keeps gap-electrodes bright as new and also stabilizes low sparkover characteristics.

G-E Pellet arresters are also distinguished by their unique valve material—lead dioxide pellets—which provides valve-action with *exceptionally low* IR drop—and which is unaffected by atmospheric moisture, condensation or humidity. These are reasons why the excellent protective characteristics of Pellet arresters *stay* excellent.



G-E Pellet Arresters limit lightning voltages to lower levels than any other distribution arrester—all ratings will easily withstand the AIEE-NEMA standard 65,000-ampere test—and they are applicable on <u>any</u> distribution system, urban or rural. For further details see your nearest G-E dealer or write for Bulletin GEA-2975. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

YOU BUY <u>BETTER</u> PROTECTION WHEN YOU BUY <u>PELLET</u> ARRESTERS!
THE QUALITY-STANDARD OF THE INDUSTRY FOR MORE THAN 25 YEARS

GENERAL ELECTRIC

WIRING NEWS

A PERIODICAL DIGEST OF WIRING IDEAS FROM THE GENERAL ELECTRIC CONSTRUCTION MATERIALS DEPARTMENT

Free Chart Speeds Box Selection

The chore of selecting the proper switch or outlet box for any job is now made easy and sure by a new, large-size chart, recently published by the General Electric Construction Materials Department.

Illustrating each type of switch and outlet box—giving all box dimensions—listing number of conductors permitted for each wire size—this chart helps you make your choice at a glance. In addition, National Electrical Code requirements are listed on the chart for easy reference.

If you're working on installations, you'll want one of these handy charts hanging on your wall. If you're selling, you'll want several for your customers. For free copies of the *Box Buyers' Guide*, check box (A) in the coupon, and note the number of charts you need.

Silent Switch Gives Extra-duty Service

More than a million ON-OFF cycles! That's the amazing service record of the GE 3008 mercury switch.

Your industrial customers will welcome this news of long service life. Builders will be interested in the extra "sell" that mercury switches offer. For further details on G-E mercury switches, check box (B) in the coupon.

Two Time-savers Added To Remote Control Line

General Electric has recently announced the addition of two new extra-convenience items to its remote control wiring system —for extra convenience in use, a new nine-position master selector switch—for installation savings, a new utility unit.

The new master selector switch, GE 3652, puts full ON-OFF control of nine circuits on one standard-size flush plate. A rotary switch is used to select circuits. A standard remote control switch opens or closes the selected circuit. All circuits can be instantly opened or closed by depressing the remote control switch and sweeping the rotary selector through all nine positions.

New Utility Unit

The new G-E remote control utility unit, GE 3614, containing a remote control relay and transformer in one die-cast aluminum housing, adds extra speed to remote control installations. For indoor or outdoor use, this unit requires only three simple connections: incoming and outgoing 125-volt lines and lead wires for remote control switches. Fixtures can be mounted directly on the unit or at a distance from it according to installation requirements.

If you have not yet investigated the General Electric remote-control wiring system, get full details from your local G-E distributor or from your local General Electric office. For a bulletin on the G-E remote-control wiring system and fact sheets on the new rotary switch and utility unit, check (C) in the coupon.

Existing Raceways Can Take Extra Loads

Industrial customers who are contemplating increased power loads will appreciate a tip on G-E Deltabeston® AVA cables.

In many cases, these cables can help increase load capacity up to 49% with no additional raceways. This can add up to sizeable savings for your customers. For information on AVA cables check (F) in the coupon.

Now, Get the Answers On Gas-filled Cable

Now, your questions on the use of gas-filled cable are answered in a new fact-packed booklet.

In 12 pages of text and illustrations, this booklet explains the savings and extra values that General Electric gas-filled cable offers. The advantages of self-supervision, smaller diameter, and greater uniformity of various types are fully discussed.

For your free copy of the new booklet, *G-E Gas-filled Cable*, check box (D).

Cuts Trimming Problems In Residential Areas

When you're planning new distribution through residential areas, don't overlook the two big advantages of General Electric Super Coronol® aerial cable — improved appearance and substantial economies in trimming costs.

Because these cables are fully insulated, no crossarms are required. Tree trimming can be reduced to a minimum. In some cases, this means that trimming can actually be eliminated for long periods. Even in three-phase circuits, Super Coronol aerial cables have the compactness and strength required to hold your trimming costs down.

Aerial cable can be supplied to you pre-assembled—with cable and messenger assembled at the plant for quick installation —or unassembled—for assembly of cable and messenger in the field. Single- and multiple-conductor cables are available.

Your local General Electric district office will gladly give you detailed information on aerial cables. For a handy booklet check box (E) in the coupon.

Hint for power salesmen

Practical tip for installation, maintenance, and operation personnel

Section K5-527
Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut

Please send me:

- A ☐ Box Buyers' Guide
- B ☐ Information on Mercury Switches
- C ☐ Remote-Control Booklet and fact sheets on utility unit and rotary selector switch
- D ☐ G-E Gas-filled Cables
- E ☐ Aerial Cables
- F ☐ AVA Cables

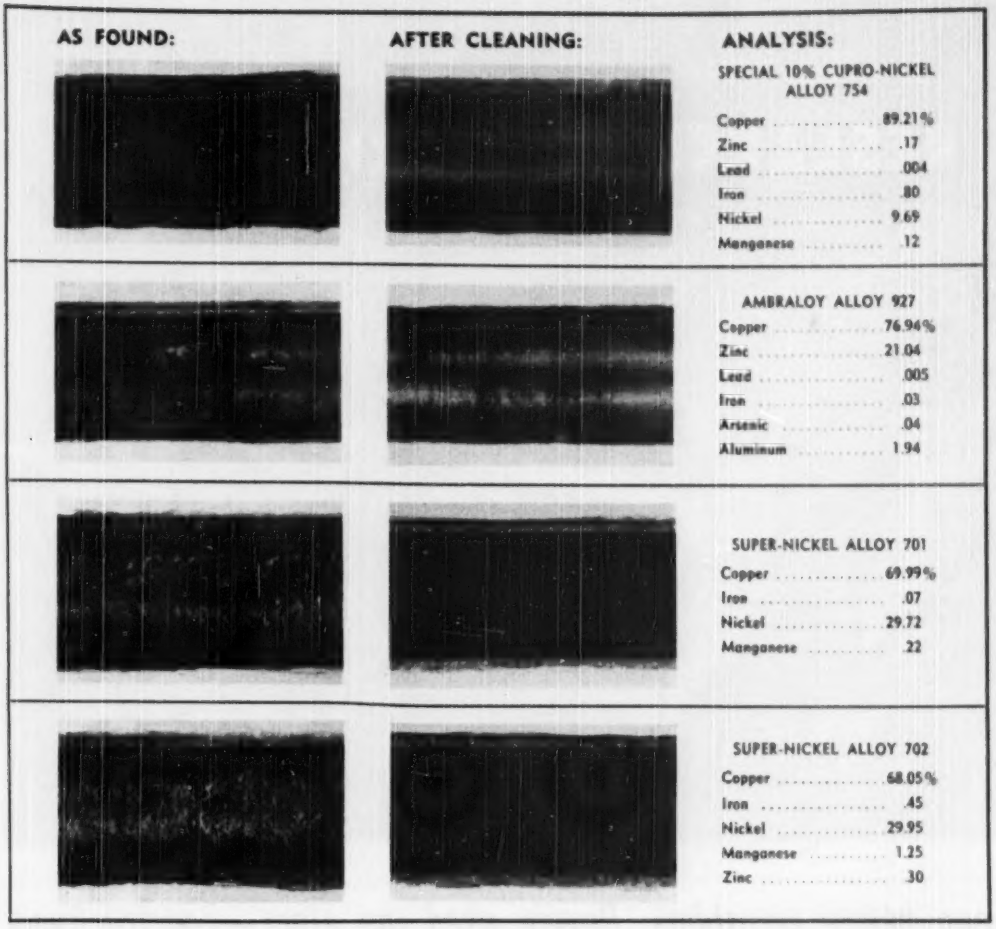
Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

GENERAL ELECTRIC



SPECIAL CUPRO-NICKEL Alloy 754 (top) was found to be most resistant to salt water corrosion in tests conducted by Central Power & Light Co. Ambraloy Alloy 927 (second from top) was a close second. Tubes made of Super-Nickel Alloys 701 and 702 (bottom two) were found to be least resistant during the 21½ months of testing in an oil cooler tubed with the several different copper alloys

Nickel-Copper Alloy Shows Marked Corrosion Resistance

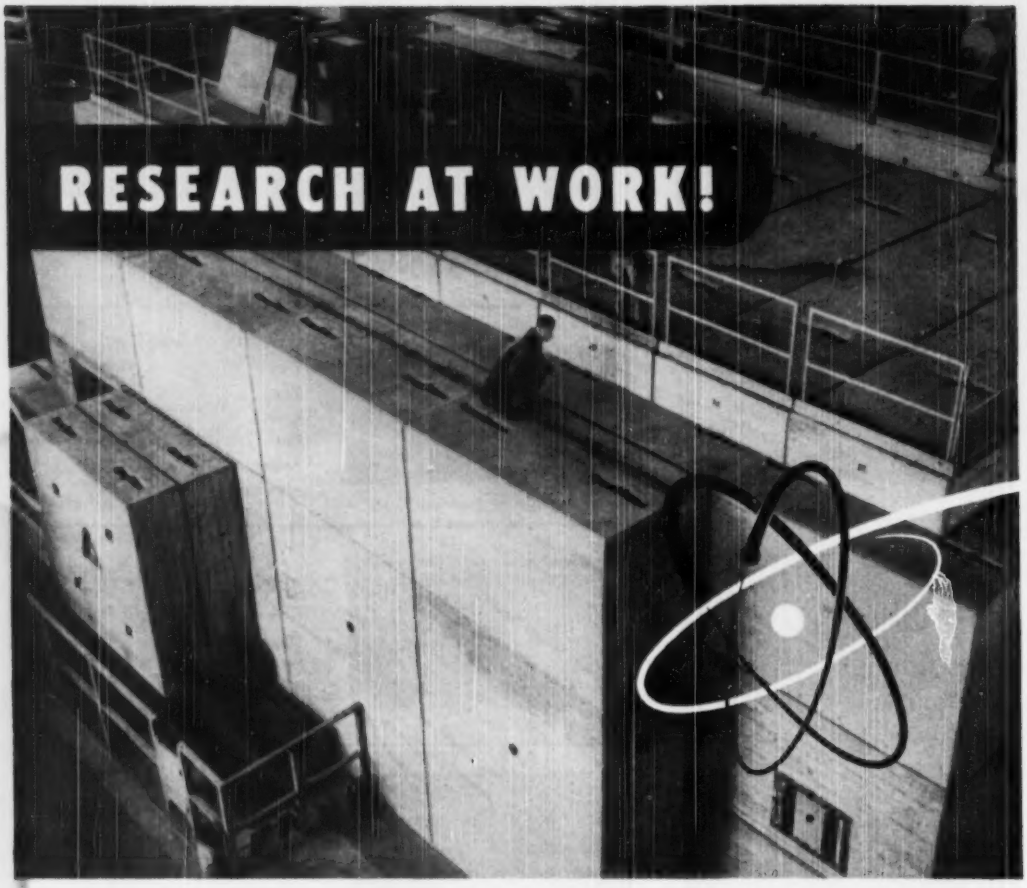
GEORGE A. MILLS
Power Plant Design & Construction Engineer
Central Power and Light Co
Corpus Christi, Tex.

TESTS extending over 21½ months showed heat-exchanger tubes of 10% nickel-89% copper to have marked resistance to corrosion caused by sea water. A close second was an aluminum-brass alloy. Least corrosion-resistant was a tube containing approximately 30% nickel and 70% copper, Alloys 701 and 702.

The tests were made to obtain comparative data on fouling and corrosion rate of various copper alloy tubes used in condensers, coolers and heat exchangers. A steam turbine oil cooler, tubed with several different copper alloys, was operated in regular service during the test.

Cooling water from the Corpus Christi ship channel varied in temperature from about 60 F in winter to 90 F in summer. Oil temperature varied from 100 F to 140 F. After the test period, the tubes were removed and cut in half to show interior tube surfaces. Portions of the interior were cleaned carefully so that tube walls could be studied for corrosive action.

The test results influenced Central Power & Light Co to purchase the special nickel-copper alloy tubes for the last three condensers installed at the Nueces Bay Station, where salt water conditions prevail.



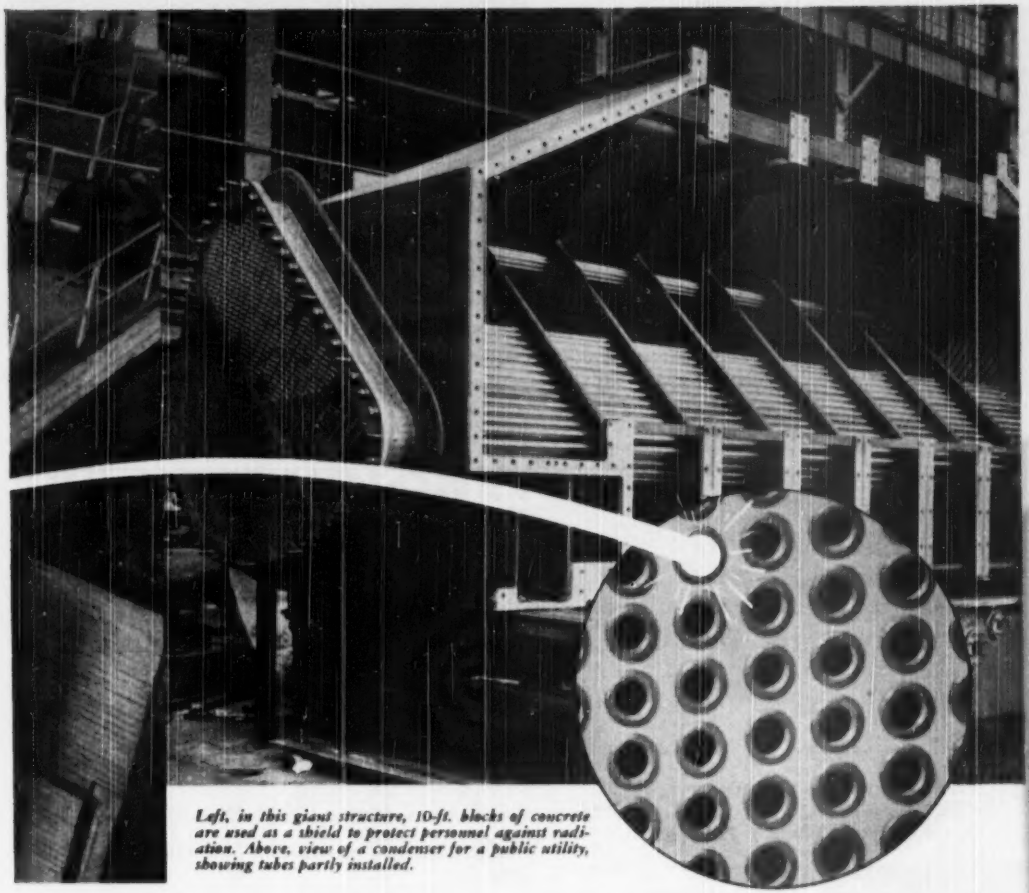
Long before Hiroshima, Revere used the atom—constructively

BEFORE the first atomic pile was built, before the first atomic bomb was exploded, Revere used the effects of the disintegrating atom for constructive research. It was in 1941 that radio-active tracer elements were employed in a Revere-sponsored investigation into the destructive process known as dezincification. This is a form of corrosion formerly of chief concern to users of copper-zinc alloy condenser tubes. In this process the alloy seems to be dissolved from localized areas, the zinc going off in solution while the copper is re-deposited as a porous plug.

A number of years ago it was found by experiment that the addition of small amounts of some other element would prevent or inhibit this electro-chemical action. Nobody knew just why or how, nor what was the best percentage for the third element. Revere decided to find out, and commissioned two able scientists in a famous Eastern technical school to conduct the necessary experiments.

In this work, radio-active elements or isotopes were produced in a cyclotron, and were used in order to determine the function of those elements in rendering the alloy more resistant to corrosion.

Briefly, the method was this: The desired radio-active element was dissolved in an acid, and the solution's radio-activity calibrated by means of a Geiger counter. A standard sample of the alloy was immersed in the solution, and from time to time the amount of the active element deposited upon it was measured with the counter. The nature of the deposited film was also checked by the electron diffraction method. This



Left, in this giant structure, 10-ft. blocks of concrete are used as a shield to protect personnel against radiation. Above, view of a condenser for a public utility, showing tubes partly installed.

was in effect an accelerated test for dezincification and its inhibition. It was repeated many times with solutions of various concentrations. This, mind you, was in 1941, before radio-active tracer procedures were of any interest except to a comparatively few scientists.

The conclusions reached as a result of these tests can be summarized as follows: The corrosion of uninhibited copper-zinc condenser tubes occurs by solution of the alloy as an entity. When an inhibitor is present, however, in the percentages revealed by the experiments, the inhibitor is re-deposited on the alloy as a film which has about the same effective electrical potential as copper. The deposition of copper is thereby prevented. One of the key processes in dezincification having been thus interrupted, the process itself is effectively stopped, or at least so reduced in activity as to provide corrosion resistance, and commercial service, for extremely long periods of time. Thus the inhibited copper-zinc alloy condenser tube has become reliable and economical to an extent heretofore unrealizable.

Realistic Revere Research

Often the word "research" is thought to mean startling new discoveries and swift, amazing inventions. The fact is, however, that research does not work that way. Such modern devices as the automobile, the airplane, the telephone, radio, television, and numerous others would indeed be startling if they had been developed overnight. As we all know, they have reached their present high degree of development as a result of continuous improvement, detail after detail, problem after problem being worked out through countless hours and even years of the most painstaking research.

Revere's research is of that type. It is a continuing search for better knowledge of its materials and processes, and the way its metals may be utilized with the greatest efficiency and the maximum economy. This is not spectacular, but over the years it has made many contributions to the farm, the home, and industry.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

Current Capacities of Overhead Conductors

Table lists current capacities of bare copper, ACSR and all-aluminum conductors, triple-braid weatherproof solid and stranded copper conductors, and double-braid weatherproof ACSR and all-aluminum conductors, all carried overhead and for normal summer and winter operation as suggested for application on AG & E system. Ratings have been rounded off to values which can be read on an ammeter. Basic conditions are given

H. A. ENOS
Chief Distribution Engineer
American Gas & Electric Service Corp
New York, N. Y.

NOTES

Permissible currents are based on the following conditions:

Summer air temperature of 110 F (43 C)

Winter air temperature of 60 F (16 C)

Wind velocity of one mile per hour crosswise to conductor

Maximum conductor temperature of 176 F (80 C)

Bare conductor surface conditions —moderately discolored or very black

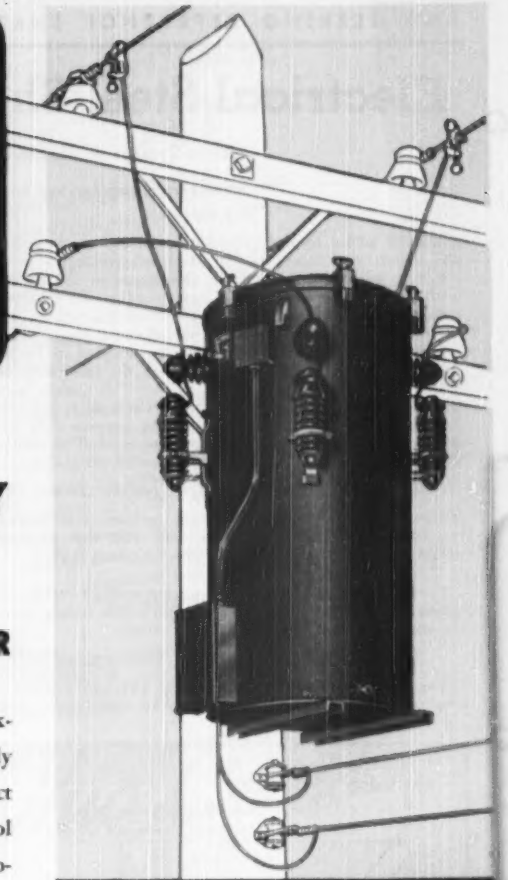
Maximum temperature of braid surface 158 F (70 C)

Do not use "winter" values if there is any possibility of the air temperature being above 60 F (16 C) at time of maximum load.

Ampere Ratings of Line Conductors In Normal Operation Outdoors
(See Notes)

Conductor		Bare				Weatherproof	
		Summer		Winter			
Kind	Size, AWG or Cir Mils	Moderately Discolored	Very Black	Moderately Discolored	Very Black	Summer	Winter
						Triple Braid	
Copper Solid	8	79	81	105	107	87	126
	6	106	108	141	144	115	166
	4	142	145	190	193	152	220
	2	190	195	255	260	205	295
						Triple Braid	
Copper Stranded (Strands in Parentheses)	2 (7)	195	200	260	265	205	300
	1 (7)	225	230	305	310	235	345
	1/0 (7)	265	270	350	360	275	400
	2/0 (7)	305	310	410	420	320	460
	3/0 (7)	355	365	475	490	370	535
	4/0 (7)	415	420	555	570	430	625
	250,000 (19)	460	470	620	635	480	700
	300,000 (19)	530	530	695	720	535	780
	350,000 (19)	575	585	770	790	595	870
	400,000 (19)	625	640	840	870	645	950
	500,000 (37)	720	740	970	1000	750	1100
	600,000 (37)	810	830	1090	1130	840	1240
	700,000 (61)	890	920	1200	1240	930	1360
	750,000 (61)	930	960	1250	1300	970	1420
	800,000 (61)	970	1000	1300	1350	1010	1480
	900,000 (61)	1040	1070	1400	1460	1080	1590
	1,000,000 (61)	1110	1150	1500	1550	1160	1700
						Double Braid	
ACSR (Strands in Parentheses)	4 (6/1)	102	117	141	156	117	170
	2 (6/1)	132	154	184	205	154	225
	1/0 (6/1)	170	200	240	275	205	295
	2/0 (6/1)	195	235	275	315	235	340
	3/0 (6/1)	220	270	315	365	270	390
	4/0 (6/1)	250	310	360	415	305	445
	336,400 (26/7)	370	465	530	625	455	665
	397,500 (26/7)	405	515	590	700	----	----
	477,000 (26/7)	450	580	660	790	----	----
	556,500 (26/7)	500	645	730	870	----	----
	636,000 (26/7)	540	705	790	960	----	----
	795,000 (26/7)	615	820	910	1110	----	----
						Double Braid	
All-Aluminum (Strands in Parentheses)	4 (7)	102	117	142	156	117	170
	2 (7)	135	157	190	210	157	230
	1/0 (7)	180	210	250	285	210	310
	2/0 (7)	205	245	290	330	245	360
	3/0 (7)	240	285	335	385	285	415
	4/0 (7)	275	330	390	450	330	480
	336,400 (19)	360	450	520	610	445	650
	397,500 (19)	400	500	580	680	495	720
	477,000 (19)	445	565	645	770	565	830
	556,500 (19)	490	625	710	850	----	----
	636,000 (37)	530	680	775	930	----	----
	795,000 (37)	600	790	890	1080	----	----

Cut Installation Costs . . . Save 2/3 of Installation Time . . . Improve Appearance



WITH

THE NEW MOLONEY "packaged-unit" CONSTANT CURRENT TRANSFORMER

Save time and money with the new Moloney "Packaged-Unit" Constant Current Transformers. Simply hang the "Packaged-Unit" on the pole . . . connect primary and secondary leads . . . connect the control line . . . *and that's all!* Comes complete with all protective and control equipment incorporated as a part of the transformer to permit unit installation. No separate installations of lightning arrestors, primary fuse cutouts, oil switches or protective relays.

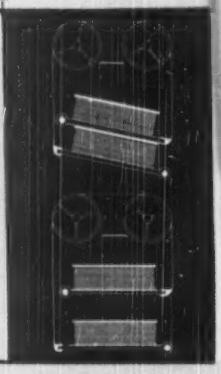
Write today to Moloney Electric Co., St. Louis 20, Mo., for Bulletin SL-702 giving complete information.

Sales offices in all principal cities

MESO-4

EXCLUSIVE MOLONEY FEATURE

Both coils move on Moloney transformers. Each coil moves only half the distance required by the moving coil of a single-moving-coil type regulator, on starting or during changes in load. This means quicker response . . . longer lamp life. Diagram shows starting position (above) and half load position (below). Bottom and top coil move apart simultaneously.



MOLONEY
ELECTRIC COMPANY
FACTORIES AT ST. LOUIS 20, MO.
AND TORONTO, ONTARIO, CANADA

MOLONEY ELECTRIC

Electrical Steel Sheets

Silicon Content vs Density and Electrical Resistance. An adaptation from engineering manual of Carnegie-Illinois Steel Corp

SILICON added to low carbon open hearth steels reduces the density and increases the electrical resistance of the resulting silicon-steel alloy. It also improves the permeability of the alloy after proper heat treating and other mill operations. Because of the increased resistance, the eddy current loss in the sheet is reduced, and due to the improved permeability the hysteresis loss is also reduced in the low and medium flux density ranges. Thus the total core loss is reduced.

Chart I shows relation between silicon content and density.

Curve 1 is a straight line representing average data from measurements of samples cut from commercial sheet bars with no surface scale present. The equation is:

$$\text{Density} = 7.865 - (0.0650 \times \text{percent silicon}) \quad (1)$$

Where density is in grams per cubic centimeter at approximately 20 C. Deviation of these data from the calculated values of Eq (1) is well within plus or minus 0.4%.

Curve 2 is a straight line representing average commercial values from flat rolled silicon steel with a thin tightly adhering surface oxide. The equation is:

$$\text{Density} = 7.830 - (0.0666 \times \text{percent silicon}). \quad (2)$$

The change in density between Eq (1) and Eq (2) is approximately 0.5%. As these data were obtained on sheets ranging in thickness from 24 to 29 gauge, the thickness effect is included in Eq (2), which gives an accuracy in data reproduction of within plus or minus 0.4%.

The heavy horizontal lines on the chart show the range of silicon contents for each of the associated density values, these being the assumed densities for test purposes in accordance with ASTM Standard Test Method A-34, and as follows:

Silicon Content Range %	Assured Density g/cu cm
0 to 0.5	7.85
over 0.5 to 2.0	7.75
" 2.0 to 3.5	7.65
" 3.5 to 5.0	7.55

Chart II gives the relation between silicon content and electrical resistance. The relation is expressed by the linear equation:

$$\text{Resistance} = 13.25 + (11.3 \times \text{percent silicon}) \quad (3)$$

Where resistance is in microhms per cubic centimeter at approximately 20 C.

This equation is satisfactory for silicons of 0.25% and upward, as there are some indications that resistance for no silicon is lower than 13.25 microhms. The deviation of observed data from the straight line is well within 1%.

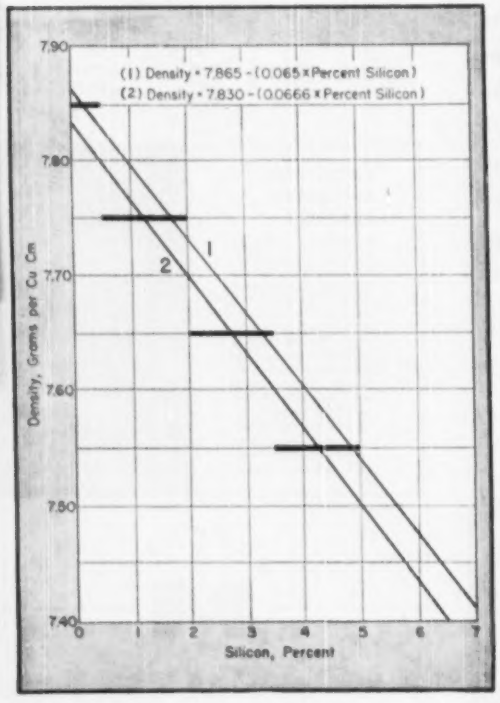


CHART I—Relation of density to silicon content

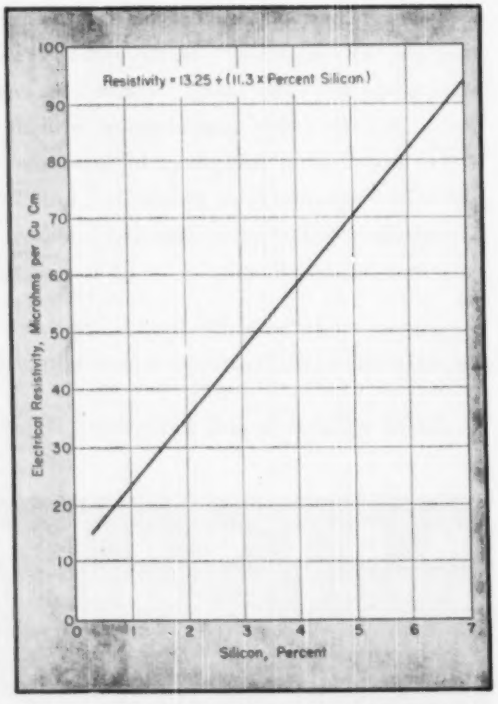


CHART II—Relation of electrical resistivity to silicon content

Stop Burned-down Jumper Loops!

O-B Strain Clamps permit construction of continuous jumpers that eliminate hazardous clamped connections

Bolted connectors in the jumper loops of high voltage transmission line strain points change with time. Once tight and conductive, they eventually relax due to strand collapse and bolt stretch. Corrosion and poor contact then lead to heating and burn-down. This is no hypothetical case. It is a reported experience the country over!

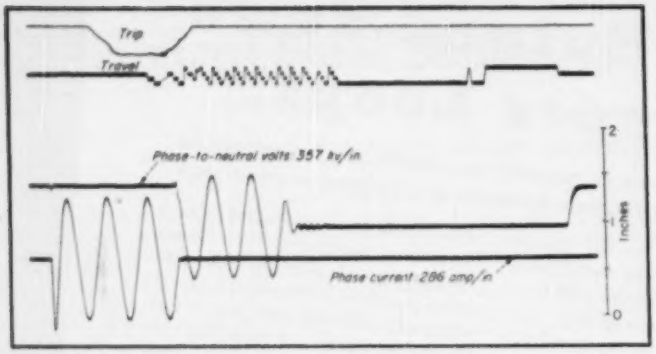
Eliminate this trouble in the simplest, surest way--eliminate the splice. This is done by stringing through all deadend points with a continuous conductor. O-B strain clamps make this possible. They also make possible an important list of economies, starting with the cost of the clamp itself, and including the elimination of all special field equipment for clamp attachment, rapid installation, and complete inspection of the cable attachment during construction or at any later time.

With a lower first cost from many angles, you gain the added advantage of unspliced jumper loops--with the elimination of their serious troubles--when you specify O-B strain clamps on your new transmission line construction.

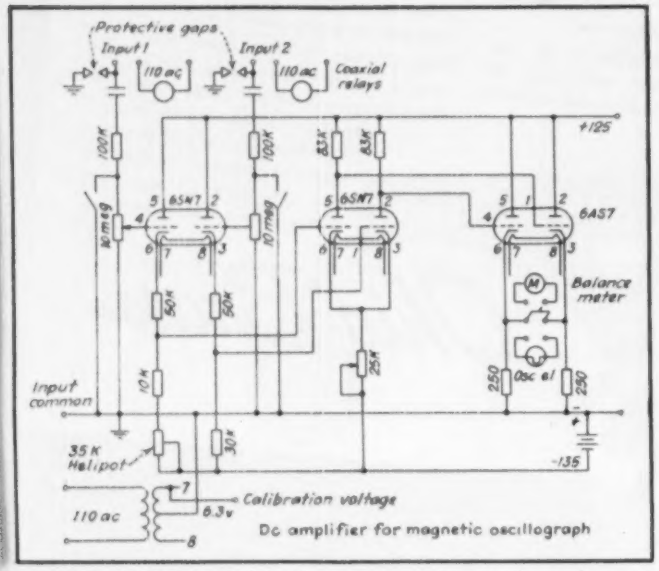
Ohio Brass

MANSFIELD • OHIO

5081-H



LINE-DROPPING TEST, in which a capacitor bank simulates an open line, as recorded by a magnetic oscillograph and new amplifier. Note unsymmetrical voltage across the breaker, and trapped voltage on capacitors. Test was performed in Westinghouse high power lab



AMPLIFIER CIRCUIT has high-impedance input needed to extend use of magnetic oscillograph

Amplifier Extends Field of Magnetic Oscillograph

C. J. TIRK
Engineering Laboratories
Westinghouse Electric Corp
East Pittsburgh

EXTENSION of the utility of the magnetic oscillograph in the measurement field, without modifying any of its desirable characteristics, is promised by a new amplifier with high input impedance (10 megohms).

This amplifier permits the use of the oscillograph with various capacitance voltage dividers, as well as making possible a performance record of electronic control systems and servomechanisms, with no more burden on the circuits than would be imposed by a vacuum-tube voltmeter. With the amplifier, an oscillograph could be used to record voltages appearing at potential taps of condenser bushings or carrier-current coupling devices.

The amplifier has input and output stages cathode-coupled to give high input and low output impedances; second stage is plate-coupled to provide voltage gain. Double input is arranged so that the difference of two voltages above ground potential can be measured with the amplifier chassis and power supply grounded. Within the frequency range of the oscillograph, amplifier distortion, including phase shift, is reported to be negligible.

Calibrating Voltage Provided

With a high-frequency-response element, the sensitivity is about 3 v per in.; with a high sensitivity element, 0.06 v per in. A source of calibrating voltage is provided, although most tests for which the amplifier is suitable are staged, or are of such a nature that the device is self-calibrating.

Input leads are shielded cable and are connected to the amplifier through coaxial relays. Small gaps provide protection against accidental overvoltages. Plate power for first two stages is supplied internally by batteries. Output stage requires 0.5 amp at 125 v dc from an external source.

Useful in Line-dropping Test

This amplifier is said to be particularly useful in line-dropping tests (see illustration). For example, if the voltage across a breaker on opening is required, the voltage across two capacitance dividers can be measured. By opening the circuit to one divider, the gain can be adjusted for proper deflection. Furthermore, relays on the amplifier chassis make possible rapid disconnection of the amplifier to avoid draining the voltage divider.

Patent application on this amplifier circuit has been filed.

Local Buying Saves Where Freight is Factor

C. H. RHUDY
Supt of Transportation
California Electric Power Co
Riverside, Calif.

BUYING locally-made concrete anchors has saved California Electric Power Co $1 on every four anchors.

Freight cost for hauling 43-lb 15-in. anchors about 250 miles to one

BOARD of DIRECTORS

meeting on a machine screw

Sounds like an exaggeration, doesn't it? But it's not so far-fetched when you consider that this machine screw symbolizes a whole group of fastenings that have been failing in service because of corrosion.

More or less, this happens every day in American industry. A small bolt or screw or rivet, that was never designed for use under corrosive conditions, gives way—and the whole machine, or process, grinds to a stop.

The only way to keep out of this picture is to make sure that the fastenings you use are non-ferrous or stainless steel.

Harper specializes in these Everlasting Fastenings; makes them in over 7000 different sizes, types and alloys—Brass, Bronzes, Copper, Monel and Stainless Steels; maintains large quantities in stock, ready for immediate delivery from distributors and warehouses located in principal cities.

If rust and corrosion resistance is important to you . . . if you can see the real economy in replacing common steel with fastenings that are non-magnetic, longer-lasting, reusable . . . write today for our catalog and current stock list: The H. M. Harper Company, 8205 Lehigh Avenue, Morton Grove, Ill.

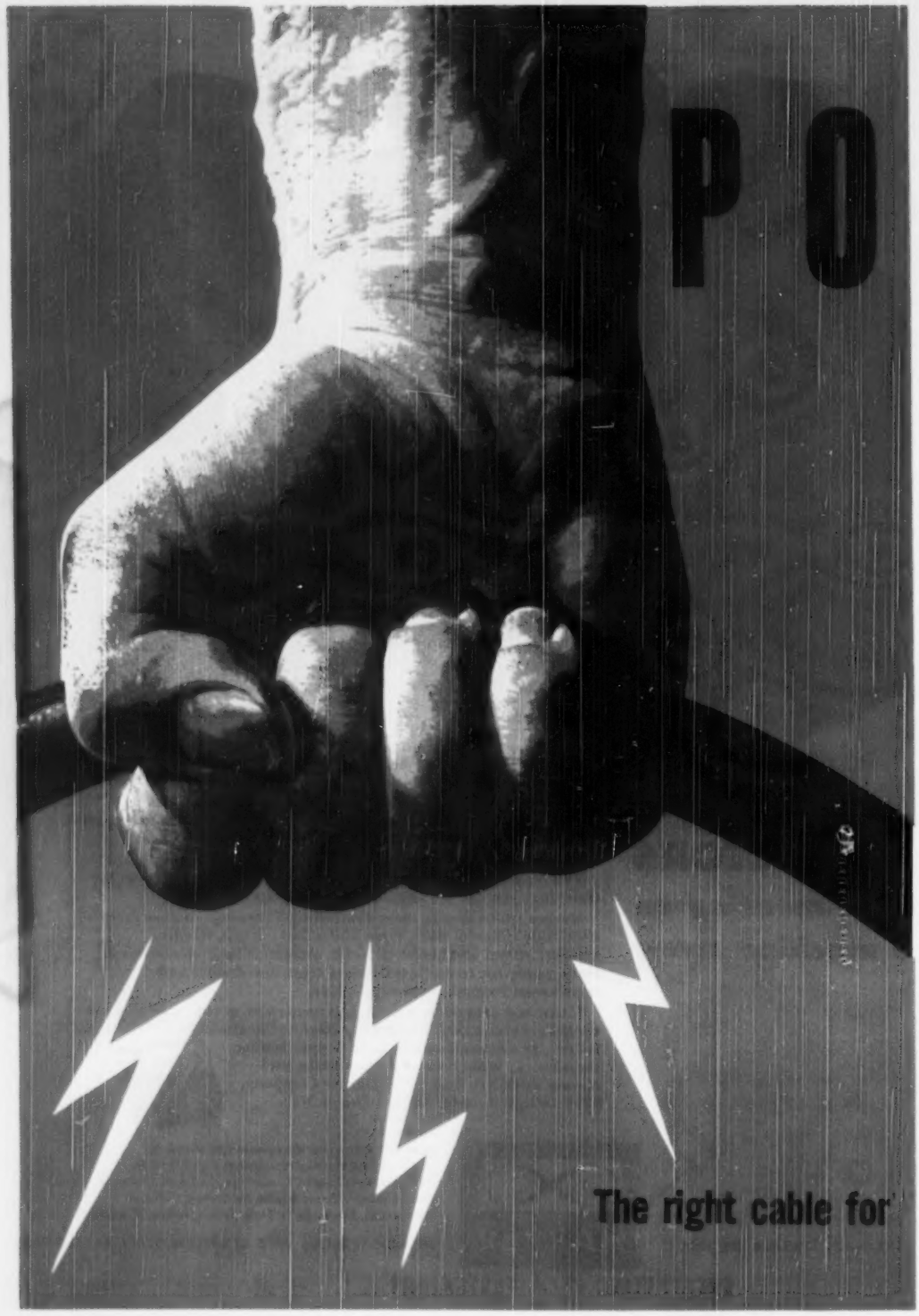
New York Office and Warehouse: 200 Hudson St.
Los Angeles Office and Warehouse: 835 E. 31st St.
Branch Offices: Atlanta, Cambridge, Cincinnati, Cleveland, Dallas, Denver, Detroit, Grand Rapids, Milwaukee, Oakland, Philadelphia, Pittsburgh, St. Louis, Seattle, Toronto (Canada)

AMERICA'S LEADING SPECIALISTS

HARPER

IN NON-FERROUS AND STAINLESS STEEL FASTENINGS

EVERLASTING FASTENINGS


P O
The right cable for

WER UP

and be prepared!

THAT'S THE CHALLENGE to 9 out of 10 industrial plants—and yours may be one! It's the challenge to prepare those plants to make full use of electric power by modernizing obsolete, worn out wiring systems, by providing adequate wiring capacity *now* and for the *future*.

POWER UP—And Be Prepared! is Anaconda's new Industrial Wiring Modernization Campaign to help industry make full, efficient use of the electric power it buys . . . to eliminate costly power waste caused by overloaded circuits, worn out electrical equipment, inefficient distribution and failure to provide for added power loads.

LIKE ANACONDA'S previous industry-wide campaigns, "Industrial Modernization," "Preventive Maintenance" and "Wire Ahead," this newest Anaconda program is designed to enlist the engineering knowledge and skills of Electric Utilities, Contractors and Wholesalers in helping American industry to POWER UP—And Be Prepared!
Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

the job **ANACONDA®** Wire and Cable

ALL-WEATHER INSULATION being applied to 5KV aerial cable with "SCOTCH" No. 33 Electrical Tape. Installation involves 5,000 feet of outdoor wiring at Danvers, Mass.

"3 in 1" plastic tape is best insulation under the sun

Under boiling sun, freezing cold, rain and sleet, this cost-cutting tape can take it! "SCOTCH" No. 33 Electrical Tape replaces three commonly used insulating materials—rubber tape, friction tape and varnish—to give your electrical installations dependable, long-lasting protection.

Available in the new 20 foot by ¾ inch "Job Size" roll, packed 12 rolls in a tube, and the 66 ft. by ¾ inch "Economy Roll" packed in individual cans. Your regular electrical supplier can fill your order.

TRY IT AT OUR EXPENSE

Sample roll plus complete details free on request to Dept. EW-550, No obligation. Write today!

Quick Facts About "SCOTCH" No. 33 Electrical Tape

- **TOUGH**—plastic backing is abrasion resistant, unaffected by water, acids, alkalies, alcohols, sunlight.
- **HIGH DIELECTRIC STRENGTH**—over 7,000 volts.
- **THIN CALIPER**—only .007 inch thick, takes less room in junction boxes, and fixture openings.
- **STRETCHY**—conforms snugly to uneven surfaces, odd shapes.
- **REMEMBER**—for perfect high-heat insulation use "SCOTCH" Electrical Tape No. 27. Glass-backed, thermosetting adhesive.

Made in U. S. A. by **MINNESOTA MINING & MFG. CO.**, Saint Paul 6, Minn.

also makers of other "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Abrasives, "3M" Adhesives.

General Export: DUREX ABRASIVES CORP., New Rochelle, N. Y.
In Canada: CANADIAN DUREX ABRASIVES LTD., Brantford, Ontario

division was 30¢ each. When local bids were called for, a price of $1.05 each was received, which compared favorably to a price of $1 each at headquarters plus freight costs.

Buying locally not only saves 25¢ per anchor but also eliminates the nuisance of handling and hauling anchors to the division.

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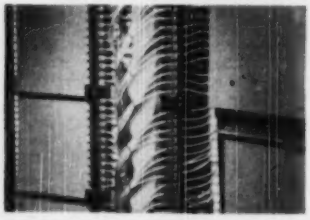


TWISTING rather than bending of hinge wires results from offsetting opposite ends of wires on swinging door panels. Increased life is thus provided at no increase in cost

Offset Wiring Gives Less Bending, Longer Life

E. D. ANDREWS
Control Section
Idaho Power Co
Boise

OFFSETTING opposite ends of hinge wires on swinging door panels eliminates direct bending and the usual bulky extra length required when connection is made straight across. Idaho Pewer Co has found this arrangement very satisfactory in construction of metal-enclosed control equipment.

The standard flexible wire used is subjected to twisting rather than bending when the door is opened and closed. Increased life is therefore anticipated, as well as better appearance, for no increase in cost.

"Self-Service" Storerooms Reduce Paper Work

IN ORDER to eliminate numerous specific requisitions for routine minor items of material Consolidated Edison Co of New York, Inc, is adopting "self-service" storerooms at certain operating plants where feasible. The "self-service" bins contain items such as nuts, bolts, washers, friction tape, etc, and are open only to authorized personnel.

the Big KEARNEY

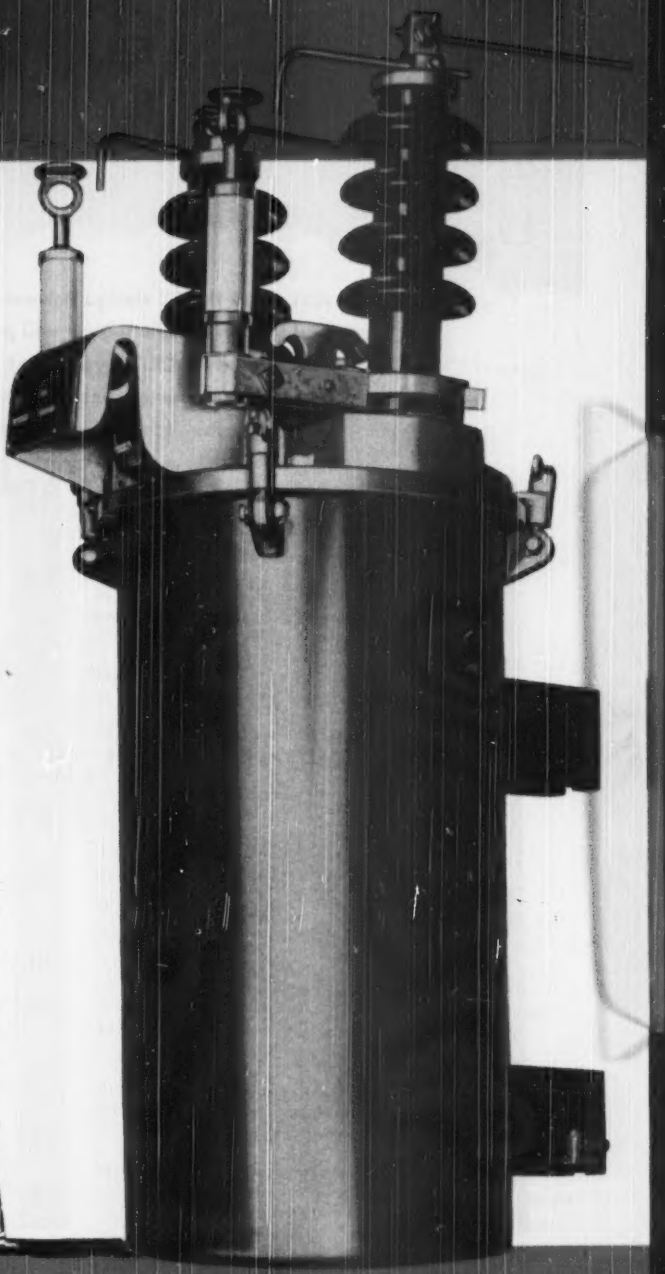
automatic

OIL CIRCUIT RECLOSER

gives you many plus values

. . . It is the only full sized OCR on the market today. Farsighted users know that it will take care of the increased loads of tomorrow.

Time current characteristics of this OCR permit replacement of any OCR on your line.

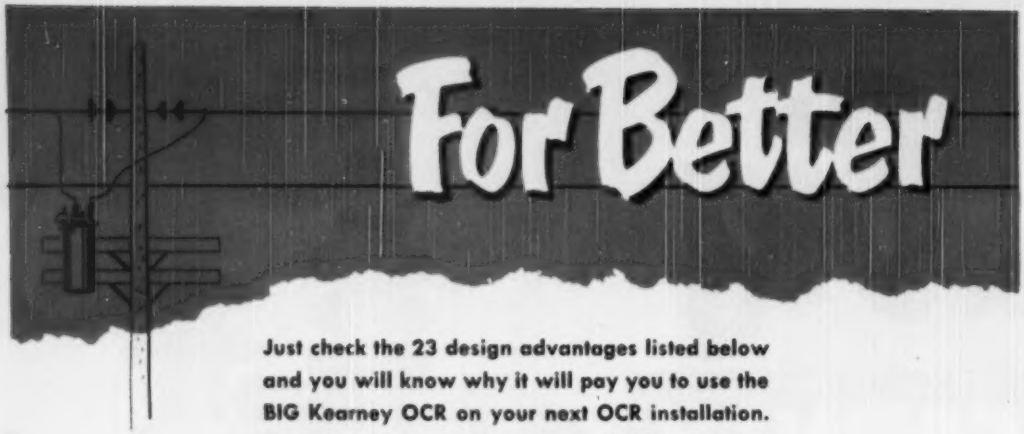


See following pages for additional information

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

JAMES R. KEARNEY CORPORATION 4224-12 Clayton Avenue, St. Louis 10, Mo.

Canadian Plant • Guelph, Ontario



Just check the 23 design advantages listed below and you will know why it will pay you to use the BIG Kearney OCR on your next OCR installation. Operating characteristics are available — be sure to specify the rating when making your request.

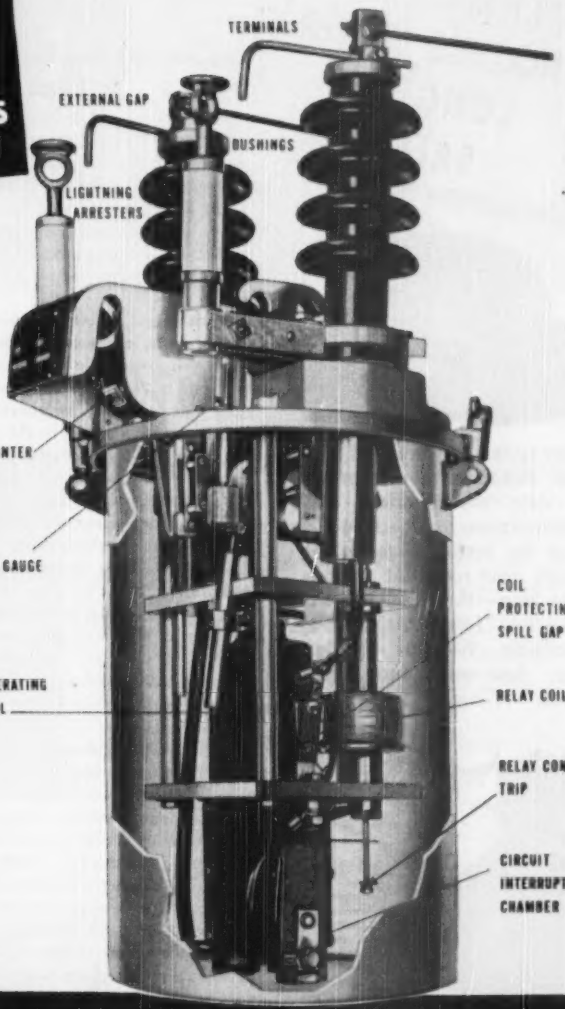
1. Steel Tank is Bonderized and painted with three coats of Baked Enamel.
2. Bushings on top of tank full 15 KV rating.
3. Operating handle is dead and independent of internal mechanism. Moves only on lockout and cannot be held closed against fault.
4. Mechanism can be rotated in the case to any position most convenient for the operating handle.
5. Operation Counter is placed at an angle so it may be read easily from a position below the recloser.
6. Recloser may be removed from tank and replaced with a recloser of another rating.
7. The rating of the recloser may be changed in the shop by changing the relay coil, and the operating coil.
8. Operation counter and operating handle are protected by a hood.
9. External oil gauge indicates level of oil.
10. Standard transformer mounting support provided for either pole mounting or crossarm mounting.
11. Contact chatter and pumping on fluctuating loads near the minimum tripping value are eliminated by the "two coil" operating principle.
12. On sustained faults, recloser will open four times and lock out whether the value of current is minimum tripping or maximum interrupting.
13. The sequence of opening speeds will be in accordance with the setting. The open time interval between reclosures is 1.5 seconds.
14. If fault is cleared from line on the first operation, the recloser will, upon reclosing, reset in 30 seconds.
15. If fault is of such duration that recloser opens less than four times in succession, it will reset for four additional operations.
16. Opening time and reclosing time is controlled by a mechanical escapement which is not affected by viscosity of oil or temperature changes.
17. The various sequences of opening speeds make possible coordination with fuses and other reclosures.
18. Main contacts are of the double break type assuring greater clearance between contacts after circuit is open.
19. Main contacts are wiped clean by each operation.
20. Main contact material is special arc-resisting alloy to assure long life.
21. External lightning protection is provided on each bushing.
22. Impulse withstand test voltage to ground 110,000 volts.
23. Coils are protected from surge voltages by an internal spill gap.

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

Better Construction — *SAFER* Maintenance

Line Protection

Less Frequent Oil Changes and Maintenance Trips



Specify the **Big**

KEARNEY

Automatic

OCR

JAMES R. KEARNEY CORPORATION 4224-42 Clayton Ave., St. Louis 10, Missouri

EVERSTICK ANCHORS...

First Choice for

PERMANENCE
HOLDING POWER
LONG LIFE
SAFETY

They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install — made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way and cone types. Write for facts.

AN EXCLUSIVE
EVERSTICK
FEATURE
Exclusive Everstick cut housing. Locks anchor firmly as rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "The Anchor of Merit"
FAIRFIELD, IOWA

A study showed that 55% of the requisitions processed at Consolidated Edison prior to adoption of this plan were for items costing less than $2. The total amount represented by these minor requisitions accounted for only 2% of cost of the material used in the operations during the period reviewed.

It is anticipated that the "self-service" store room practice will result in substantial savings in paper work and related record keeping as well as the time of operating personnel in obtaining the minor materials.

Grounding Lines, Equipment In Rural Service

A GUIDE to kinds of grounds and their locations on distribution circuits and service drops, together with a list of equipment to be grounded, are adapted from rural distribution standards of Gulf States Utilities Co, Beaumont, Texas.

Grounding . . . On common neutral systems, at least four electrodes or driven grounds are to be installed per mile of circuit in addition to anchor and house service ground. The house service ground is the ground required at the customer's house. It may be desirable, but it is not necessary, that the pole grounds be located at points where services take off. It is important that sufficient grounds be installed to keep the resistance to ground low, but it is not so important that each individual ground have low resistance. Wherever it is possible or permissible, grounds should be attached to underground metallic water systems to aid in reducing the average ground resistance.

The same consideration should be given to secondary neutrals of systems which do not have a common primary and secondary neutral. Furthermore, these neutrals should be tied together to obtain a secondary neutral network. With either a common neutral or secondary neutral network, it is possible to take full advantage of the benefits of interconnection of primary arrester and secondary neutrals without the use of additional ground rods or grounds.

Ground Wire . . . Ground wires shall not be smaller than No. 6 bare, soft drawn wire. They shall be covered with moulding for a distance of 8 ft above ground and from the point where they first touch the top of the pole to a distance of at least 4 ft below the lowest crossarm or rack.

Equipment . . . Having obtained a grounding system, the following equipment shall be grounded:

1. Secondary neutrals
2. Lightning arresters
3. Transformer tanks
4. Switch handles.
5. Tanks of oil recloses (metal)
6. Neutral of each customer's service (at the house)
7. D & W oil cutout tanks
8. Neutral of one of the transformer secondaries of three-phase banks
9. One side of the secondary of each potential or current transformer, the transformer frames and both metal meter boxes on primary or secondary meters
10. Meter sockets or bases

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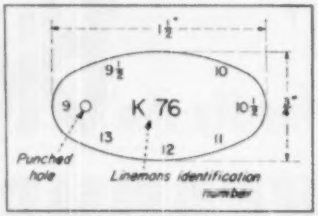
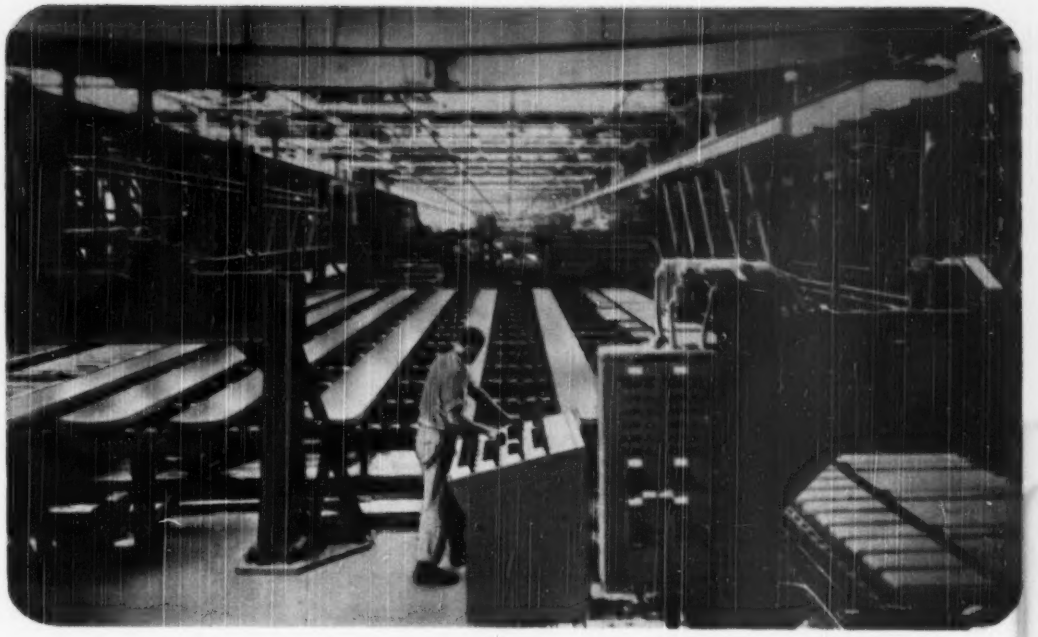


GLOVE TAG identifies glove size by location of hole. In practice, of course, only one hole is punched in any individual tag

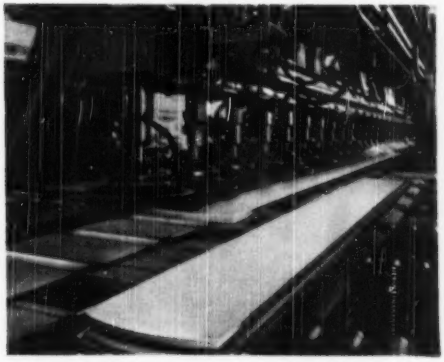
Tag for Identification Of Glove Size

J. F. STASAITIS
Central Laboratory
New England Power Co
Worcester, Mass.

BEFORE the present method of indicating rubber glove sizes on attached non-metal tags was adopted, it was necessary to make some 3,500 file references annually to get the correct sizes for renewal. Elimination of file reference has been done by punching an identification tag when it is attached to the glove. The hole is located in accordance with the glove size. Thus each lineman gets the glove size he prefers, and without delay of checking file data.



TO BUILD OR NOT TO BUILD



The smaller illustration is of the vacuum cup handling equipment operating in conjunction with the 2-Hi Cold Rolling Mill. Because of the massive size and weight of individual brass bars, all handling is mechanical.

This Mill, designed and constructed by Stone & Webster Engineering Corporation, is capable of producing the heaviest non-welded coils of strip brass, and includes the largest cold breaking-down mill in America.

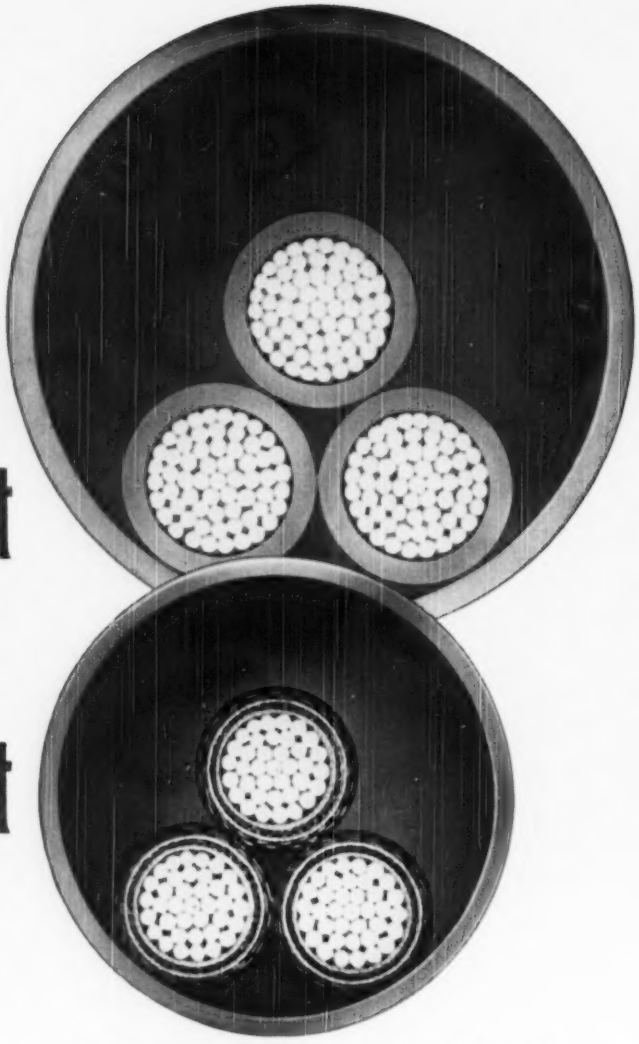
For Scovill Manufacturing Company, Stone & Webster Engineering Corporation carried on continuing studies of the client's production operations over a period of four years. Analysis was made of production pattern for anticipated requirements, with costs of production in proposed mills compared with costs in the existing plant.

Companies today, faced with improving production facilities or lowering cost of plant operation, find comprehensive engineering reports by Stone & Webster Engineering Corporation valuable in developing sound, long range production plans.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

Why Buy 4" Conduit when 3" Conduit will do?



INSTALLED COSTS ARE LOWER

*with high-rated ROCKBESTOS A.V.C.® and a 430 Ampere Load**

Size for size A. V. C. has a HIGHER AMPERE RATING — Hi ...YOUR BEST BUY

- you buy 25% *smaller* conduit
- you use 38% *smaller* cable
- you use *smaller* fittings and lugs
- you have lower labor costs because smaller, lighter cable and conduit are quicker and easier to handle.

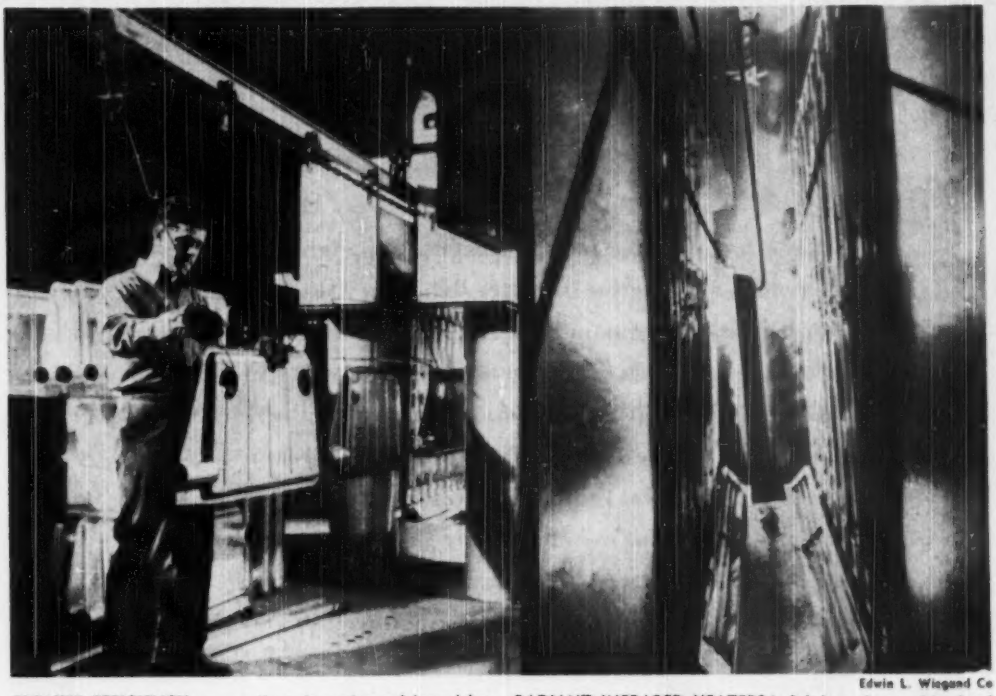
To save money specify *permanently-insulated* Rockbestos A.V.C. Write for the booklet "The Story of An Insulation."

*Comparison made with Type RH based on Chapter X, National Electrical Code, 40°C-104°F Ambient

ROCKBESTOS A.V.C.

ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONN.

NEW YORK CLEVELAND DETROIT CHICAGO PITTSBURGH ST. LOUIS LOS ANGELES OAKLAND, CAL.



Edwin L. Wiegand Co

GREATER EFFICIENCY, more uniform degreasing and lower labor costs are claimed for this 72-kw radiant infrared oven at Lawson Mfg Co, Pittsburgh. Conveyor carries sheet metal floor furnace parts on 36 sec trip through oven where all trace of oil is removed. Conveyorizing this operation has eliminated the former excess handling

RADIANT INFRARED HEATERS in 3-ft long glass wool insulated oven vaporize grease on sheet metal furnace parts. Oven has two banks of nine vertically mounted 3.6-kw heaters. Each bank has one 3.6-kw heater mounted at the base on a 45-deg angle to increase temperature at bottom of work. Conveyor moves at 5 ft per min

Infrared Oven Cuts Degreasing Costs

REDUCED LABOR COSTS, greater efficiency and more uniform degreasing are reported by the Lawson Manufacturing Co, Pittsburgh, Pa., since they started using their improved and more economical method of degreasing sheet metal parts for the floor furnaces they manufacture. All-metal electric radiant heaters have replaced the previously used vapor method; and conveyorizing the operation has eliminated the excess handling involved.

Degreasing 31 x 20 in. sheet metal parts is now done at a fraction of the cost of the old method. A continuous conveyor now carries the parts without interruption through a space-saving infrared oven that removes all trace of oil in 36 sec.

Load is 72 Kw

The oven consists of two banks of nine vertically mounted 3.6-kw radiant type heaters, each bank with a heater at the base mounted on a 45-deg angle to increase the temperature on the bottom edge of the work. Total installed capacity is 72 kw. The heated section of the oven is approximately three ft long and the conveyor moves at five ft per min.

During the 36 sec the parts move between the heater banks, the temperature rises and vaporizes the oil coating. Emerging from the oven the parts proceed to the next operation. One hundred and sixty parts can be handled in an hour at an energy cost of one cent apiece.

The oven's 2-min heatup time permits the use of heat only as needed and its efficiency was increased by insulating the space behind the heaters with glass wool. A hood was installed overhead and a low volume fan is used to remove exhaust from the building.

ANNOUNCING

FOR MERCHANDISING ACCOMPLISHMENT

In announcing the Hughes Award for 1950, Hotpoint again looks at Tomorrow Today. Hotpoint believes that the advancements made *today* in the field of electrical appliance merchandising will be reflected *tomorrow* in better living for American people.

Each progressive merchandising step reaps its reward in the strengthening of the bond between the users of electricity and the makers of electricity. Adroit merchandising keeps alive the spirit of both cooperation and competition, without which, progress is impeded.

As the electrical industry moves forward, so does its service to its customers. Skillful merchandising then, is the implement by which greater values are placed in its customers' hands.

And so, Hotpoint again is proud to announce the 1950 Hughes Awards.

"Through the continued sponsorship of these Awards, Hotpoint foresees recognition of far greater accomplishment than the years just past have offered. The Hughes Awards of the future will record an era of electrical living that, as of today, has only barely started."

President
Hotpoint, Inc.

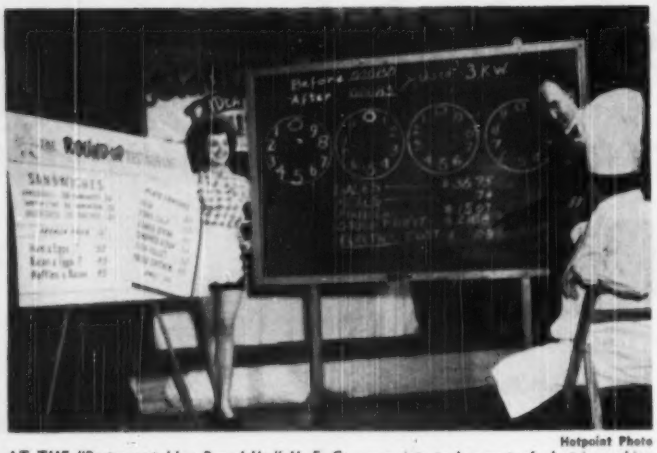
• • • *The 1950 Hughes Awards*

AMONG ELECTRIC UTILITY COMPANIES

A full description of the 1950 Hughes awards, their purposes and their prizes will be sent upon request. Write Utility Division, Hotpoint, Inc., 5600 W. Taylor Street, Chicago 44, Illinois.

Hotpoint Inc.

(A GENERAL ELECTRIC AFFILIATE)



Hotpoint Photo

AT THE "Restaurant Idea Round-Up," H. E. Carney points to low cost of electric cooking while "cook" and "waitress" look on. Waitress circulated in audience "taking orders" which were prepared as part of the show. Meter read before and after show demonstrated low costs

Skit Shows Restaurant Men Electric Cooking Facts

IN ORDER to familiarize customers with facts known to the experts in Commercial Electric Cooking a plan was evolved in Toledo to take a national manufacturer's sales training school to the field.

"Theory is never any better than the result it produces. Ideas that cannot be demonstrated by salesmen are of small value to them," according to H. E. Carney, commercial sales manager of The Toledo Edison Co.

"That is why the 'Restaurant Idea Round-Up' was developed—to make theory work."

Three-Step Plan

First step in this plan consisted of a two-day factory sales training course put on in the Edison Co's auditorium and attended by all company commercial salesmen, as well as all dealer salesmen. Another step in the plan was to put on a skit which would demonstrate theory and principles of electric cooking. The third step was the sales follow up, the "So What."

Specialists from the factory office came to Toledo and put on the program which was built around a skit designed to bring out seven advantages that could be achieved through electric cooking.

A small group of restaurant men and their wives were invited to a cocktail party and dinner after which the premier showing was presented. Three other shows were presented to a total attendance of 400 people representing 125 restaurants. H. E. Carney acted as the master of ceremonies.

Restaurant Men Convinced

Restaurant men were convinced that electric cooking is not only economical, but that it is cool, safe, clean and fast. A meter was read before and after each show, and costs of electricity ranged from 8 to 10¢ for the 50 to 70 short orders prepared at "Flap-Jack Flannigan's,"

No effort was made to skirt around the problem of flame cooking versus electric cooking; but, step by step each of the seven reasons why "The Flame Is Going Out" were demonstrated.

That the show was a success is evidenced by the numerous expressions of restaurant men who saw it. A typical comment came from Frank Miller, president of the Toledo and Northwestern Ohio Restaurant Association, who wrote:

"I have seen and heard a good many such displays given but fully believe that this was one of the best I have had the privilege of attending."

Residential Rates Include Heating

WHEN a residential customer uses electricity for general space heating, the facilities to serve him cost considerably more than to serve the customer without that use. This is because house heating has a very low annual load factor. But it is not wholly reasonable to charge the increase in cost to heating alone. Such a customer is usually a large user of energy for purposes other than heating which cannot be considered entirely apart from them, even though it must be recognized as the major factor in the cost increase. Present residential rates of the British Columbia Electric Co furnish a good example of reconciliation of these considerations. Analysis of the rates applying in the city of Vancouver makes this point clear.

There are two such rates, one covering general residential service excluding heating and one including it. Both rates are of the demand and energy charge form.

As respects demand the two rates are identical—$2 per kw per month billed to the nearest 100 w of measured demand in excess over 7 kw, no charge for the first 7 kw. This charge recognizes the diversity factor of the total of heating and other loads while assessing a major share of cost to the heating. Also it collects from loads other than heating if their demands rise above 7 kw.

The rate for service (exclusive of heating) figures out to 1.103¢ per kwhr for energy up to the maximum amount where the charge (1¢) for "all additional kwhr" begins.

For the general service including heating, the rate is the same except that the third block is reduced from 1,000 to 500 kw. This causes the unit price up to the point of "all additional kwhr" to become 1.335¢ (760 kwhr for $10.15).

Thus in the charge for energy both rates approach 1¢ per kwhr as the lower limit. But the rate for service excluding heating approaches the limit ahead of the rate including heating. This seems reasonable in view of the possibility that some part of the demand for heating may be excused from charge by the beginning of the demand charge at 7 kw.

Developed by three years of research . . . and now refined by tens of millions of dollars' worth of new equipment!

Gulf's GREAT NEW No-Nox

DESIGNED FOR TODAY'S POWERFUL NEW ENGINES!

Today's new cars have the most powerful *engines* ever made. AND—

They require a super, anti-knock gasoline

Such a gasoline is the *new* No-Nox. It was especially designed by Gulf scientists—working hand-in-hand with leading automotive engineers—to give you *maximum* performance in your new car.

With a gasoline like this great new No-Nox, you can be *sure* your new car will perform at its brilliant best.

And the new No-Nox not only gives *new* cars peak performance. It also gives new life, new pep, and stops knocks in older cars too — even many with heavily carboned engines!

So no matter what model you drive, get a tankful of the *new* No-Nox today.

See for *yourself* what a difference it makes!

Whisper-Quiet, Knock-Free Power!
Easy, Fast-Firing Starts!
Quick, Safe Passing!
Unexcelled Mileage!

Terrific Power in Every Drop!

GULF

Good Gulf—our famous "regular" gasoline —is now better than ever, too!

Gulf Oil Corporation • Gulf Refining Company

No. 822 is a one-and-only!

. . . it's a revolutionary laboratory development . . . the only *oriented plastic* backing with a successful pressure-sensitive adhesive mass.

No. 822 is a *single* material!

. . . completely eliminates costly packs, wraps, oily dielectrics on primary splices.

No. 822 is applied quickly!

. . . easily hand-wrapped directly over the splice. Clean, simple, completely efficient. One material . . . one quick operation.

No. 822 is 10,000 volts strong!

. . . only 9 mils thick yet with over 10,000 volts dielectric strength. Power factor .0050 (10^6 cycles). Insulation resistance greater than 8×10^4 megohms. Dielectric constant 2.6. Exceptional corona quenching characteristics.

No. 822 is moisture-, solvent-, corrosion-proof!

No known solvent for backing at room temperature. No measurable corrosion effect. Water transmission rate 0.24 gms per 100 sq. in. in 24 hrs. continuous immersion.

No. 822 is versatile!

Literally hundreds of uses . . . splicing, wrapping, insulating, corrosion coating of cables, wires, controls, pipes, conducts or what have you?

No. 822 samples are free!

WRITE TODAY for your sample, complete specifications and engineering data. Address POLYKEN, Dept. 5-2, 222 W. Adams Street, Chicago 6, Illinois.

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DIVISION OF THE KENDALL COMPANY
222 W. ADAMS ST., CHICAGO 6

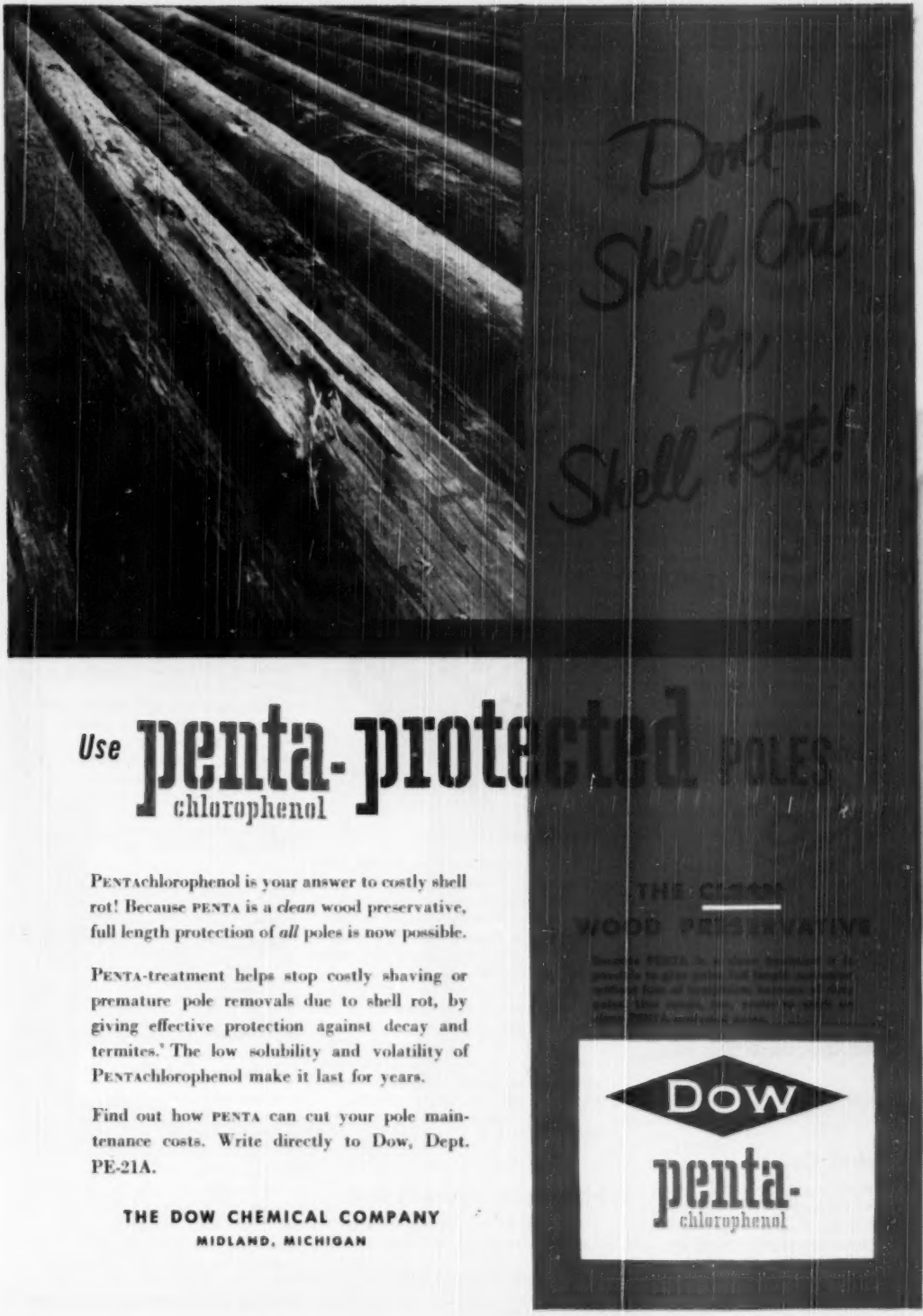
INDUSTRIAL BRIEFS

Electric Glass Melting Furnace produces highest quality glass obtainable at low cost at the Imperial Glass Company, Blair, Ohio. No highly-skilled furnace operators are necessary and space required is less than for other types. Initial cost of installation was approx one-third that of other types and amount usable glass per ton is 80% in comparison with 40% from other types. Connected heating load of furnace is 280 kw. Suggested by A. M. Newcome, Wheeling Electric Co.

Infrared Dehydrates Slippers at the L. B. Evans Co, Wakefield, Mass., after relasting for final finishing. In eight hours 2,400 pairs are turned out as compared to 800 pairs under the previously-used oven method. The infrared method also saves the use of 100 racks, each holding 24 pairs, which were necessary for storing the slippers prior to drying. The 51 ft long infrared oven uses 56 kw in G-30—375-w lamps.

Corox Type Heaters Step Up Production 18% and reduce rejects materially at the Cambridge, Ohio, plastics plant of the Continental Can Co. Maintenance has been reduced practically to zero and starting up time can be reached in 15 min instead of 45 to 60 min required under the previous band heater method used for heating cylinders in their injection molding process. The back heating zone of each head was increased from 2.9 kw to 5 kw, with a saving of one inch of space. Suggested by J. B. Christopher, Industrial Power Engineer, Ohio Power Co, Newark, Ohio.

Modern Lighting, Wiring and repainting in the general office building of the Oliver Corp, Cleveland, Ohio, make employees see better, feel better, and do better. The new fluorescent lighting provides 40 to 42 ft-c compared with 5 to 12-ft-c under the old system which had an unsightly maze of light-trapping wire, chains and pipes. Now the white painted ceiling is trim and uncluttered; outmoded wiring has been eliminated. From Cleveland Electric Illuminating Co.



Use **penta-protected** POLES

chlorophenol

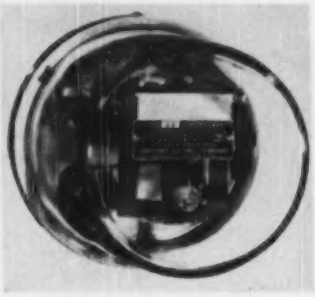
PENTAchlorophenol is your answer to costly shell rot! Because PENTA is a *clean* wood preservative, full length protection of *all* poles is now possible.

PENTA-treatment helps stop costly shaving or premature pole removals due to shell rot, by giving effective protection against decay and termites.' The low solubility and volatility of PENTAchlorophenol make it last for years.

Find out how PENTA can cut your pole maintenance costs. Write directly to Dow, Dept. PE-21A.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

NEW EQUIPMENT



Peak Load Control

SYSTEM PEAK demands are reportedly reduced by the Controlomax. It disconnects water heaters, or other deferable loads, when preferred loads, such as electric ranges, exceed established load values.

Heating effect of the current passing through the device causes a bimetallic assembly to bend sufficiently, according to pre-determined calibration, to actuate a switch connected in series with the deferable load. Rating is 60 amp, with adjustable setting providing for main circuit loads from 20 to 30 amp. At 20 amp, 250 v, it is rated for one million operations.

Two types are available: Type AS, with base and cover similar to the conventional socket type meter for indoor or outdoor installation; and Type AB mounted in a rust-resistant rectangular metal enclosure.

Sangamo Electric Co, Springfield, Ill.

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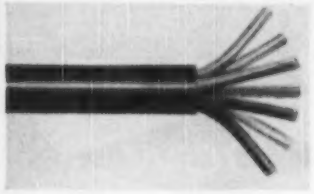

Control Cable

FOR 600-v operation PNR small diameter control cable, for an operating temperature of 75 C, is said to be 25-30% smaller and 10-15% lighter than conventional types. Tests reportedly show minimum dielectric breaks of over 20 kv on single conductors.

Individual conductors are stranded tinned copper No. 12 Awg 19/5 extruded with 16.5 mils of polyethylene, or No. 9 Awg 9/22 extruded with a 20-mil polyethylene wall. Permanent color coding is made on the polyethylene. Extruded over the polyethylene is a 4-mil nylon jacket to add stability in increased ambient temperatures.

The Rockhide sheath protects the cable from weather and sunlight, and permits installation where chemical fumes are present.

Rockbestos Products Corp, New Haven 4, Conn.

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Insulation Tester

AMONG important uses of the new Midget Megger tester, the manufacturer reports diagnosis of trouble in motors, generators, transformers, exciters, power cables, lighting circuits, and heating units. The tester is available with ohm scale and selector switch in ranges 0 to 10 megohms (100 v), 0 to 20 megohms (250 v) and 0 to 50 megohms (500 v).

A slip clutch is built into the mechanism. It is contained in a plastic case with flush terminals. Additional information appears in Bulletin 21-90-9.

James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa.

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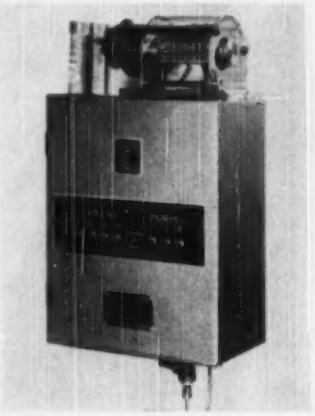
Pump and Screen Timer

THE "Midwest Automatic Timer" controls operations of screens and pumps by means of an automatic rotor timer and an integrated system of wire terminals and controls. The pressure



switch in the circuit prevents the screens from rotating until water pressure rises to the desired level. It is claimed that the burden of footwork and risk of human error is reduced in operating screens and pumps in power and industrial plants.

Three way switches, silicone prelubricated motor, automatic pressure controls, and alternate wiring for several circuits are among features of the device. Manual operation can reportedly be substituted for automatic by a quick switch-over.

Midwest Automatic Control Co, 510 Third St, Des Moines, Ia.

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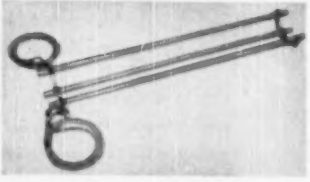


Insulator Cradle

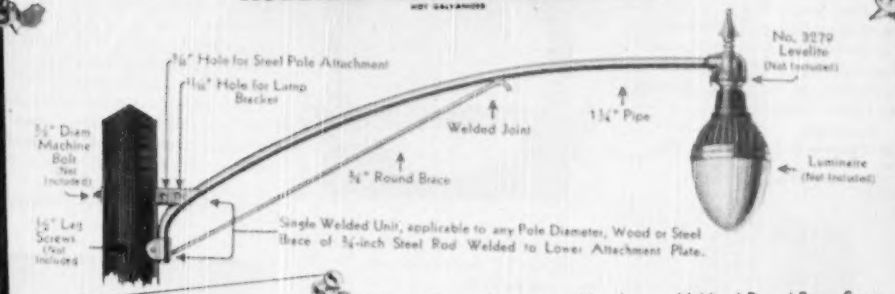
A COMBINATION insulator cradle can be used for repairing or replacing long suspension and swinging corner units "hot" as well as for normal use on dead-end structures.

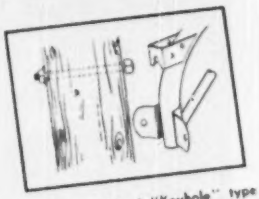
The cradle consists of laminated wooden poles, spacer brackets, swivel tie rings, and two anchoring ropes. Cradle carrier, lugs, and tie ring accessories can reportedly be attached to this basic unit to adapt it for changing out insulators on a large

THE POPULAR NEW STREET LIGHTING BRACKET

HUBBARD ROUND BRACE TYPE

HOT GALVANIZED


⅞" Hole for Steel Pole Attachment
11/16" Hole for Lamp Bracket
⅝" Diam. Machine Bolt (Not Included)
½" Lag Screws (Not Included)
Welded Joint
1¼" Pipe
¾" Round Brace
No. 3279 Levelite (Not Included)
Luminaire (Not Included)
Single Welded Unit, applicable to any Pole Diameter, Wood or Steel
Brace of ¾-inch Steel Rod Welded to Lower Attachment Plate.

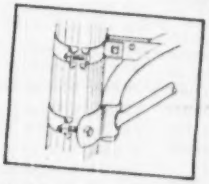


The exclusive Hubbard "Keyhole" type of attachment permits installation by one man. Insert the Machine Bolt in the pole and turn nut down so that the head of the bolt is left projecting about an inch from the pole. Simply "hang" the Bracket over the head of the bolt. Then draw nut tight and install the lags in the bottom plate.

The quick popularity attained by the new Hubbard Round Brace Street Lighting Brackets is easily understood. They have a smooth upsweeping curve that combines appealing grace with practical features of high lift and easy wiring.

Mounting space on the pole, between mounting bolt and lag screws, is only 8¾-inches, and the actual gross measurement from top to bottom of attachment is less than one foot. This extreme economy of space becomes a most desirable feature where small space is available, or where it is necessary to mount the bracket at the top of the pole to gain luminaire elevation. Attachment plates, ¾-inch round brace, and pipe are welded into one integral unit of great rigidity and strength.

The bracket may be mounted on steel poles . . . simply specify pole diameter, bands and bolts for this purpose. It is furnished with threaded end for Levelite attachment or plain end for slip-fitter luminaires.



For steel pole attachment, there is no change in the design of the arm. Bands are used, constructed to attach to the top fastening of the arm end utilizing two angle bolts to attach to the bottom fastening. For small diameter pole mountings, the "ears" on the lower attachment are drawn in by tightening the nuts until the best fit is obtained.

Stock No.	End	Nominal Length, Feet	Nominal Pipe Size, Inches	Rise—From Top of Lower Attachment Plate to Center of Pipe at Outer End—Approx. Inches	Approx. Shipping Weight Lbs. 100 Pcs.
23206	Threaded	6	1¼	26	3150
23206-P	Plain	6	1¼	26	3150
23208	Threaded	8	1¼	29	3500
23208-P	Plain	8	1¼	29	3500

HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

number of different types of structure.

With a two-pole strain carrier and supporting cradle hooks, the company states it can be used for most dead-end work. By attaching two lugs the cradle can be supported at the line end by a pair of wire tongs, the structure end hinging at the tie rings. Insulators may then be lowered to a vertical position for changing out. With the aid of the cradle carrier, the cradle is converted for use with a swinging boom on long tower dead-ends.

A. B. Chance Co, Centralia, Mo.

•

Photoelectric Accessories

GENERAL PURPOSE light sources (illustrated) and phototube holders have been added to the standard line of accessories for photoelectric relays. The relays to which these accessories can be applied include those used to indicate water level, counting, signalling, limiting and protecting.

The light sources have snap-on covers said to make possible lamp replacement in about 20 sec. They are about 7 in. high, 2½ in. wide, and 5 in. deep, with either one or two 1.5-in.-diam lenses.

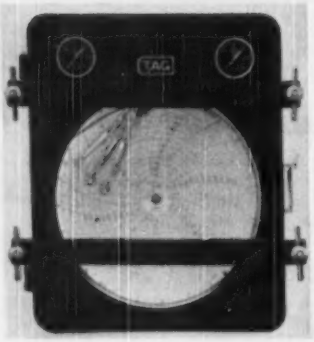
The phototube holder is furnished complete with phototube, lens, masks, and 9 ft of connecting cable. For mounting, both a mounting clamp (giving 360 deg horizontal and 120 deg vertical adjustment) and a standard pipe thread for ½-in. conduit are provided.

General Electric Co, Apparatus Dept, Schenectady 5, N. Y.

•

Humidity Controller

FOR PROCESS industries and utilities, an instrument has been developed which records and automatically controls humidity. Utilizing the psychrometric wet and dry bulb principle, the controller is stated to regulate automatically the wet-bulb (relative-humidity) depression for which it is set, regardless of fluctuations in the dry-bulb temperature.



Two pens operate on a circular 10-in. chart, simultaneously recording the dry-bulb temperature and the wet-bulb depression. Flow of the humidifying agent, moisture, steam, or oil fog is regulated by a valve which is operated by the control instrument.

Weston Electrical Instrument Corp, 614 Frelinghuysen Ave, Newark 5, N. J.

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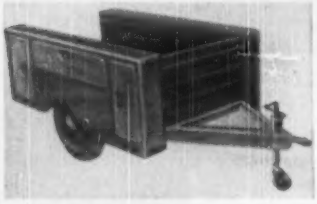

TRAILER—Crews and equipment can be delivered to various locations without tying up trucks by hitching a number of Trailettes to one truck or automobile and leaving them where needed. Two models are available, one 91 5/16 in. long, the other 75 in. long. Features and specifications appear in Bulletin B50-4-A.

Morrison Steel Products, Inc, Buffalo, N. Y.

MORE NEW EQUIPMENT

Just Received

Appearing Next Issue

OIL CIRCUIT BREAKERS
Ten million kva interrupting rating at 230 kv for new CB line

METER SOCKET CHANNEL
Only sealing ring need be removed to test or replace meter

SYNCHRONOUS MOTOR CONTROL
Line disturbance reported minimized by factory-wired units

MAGNETIC STARTERS
Coupled with disconnect means at the starter location

Conducting Glass

A NEW ELECTRICAL conducting glass is reported to be best suited for baking or drying applications where a uniform temperature over an area is desired. The glass has a transparent skin that offers sufficient electrical resistance to heat the glass up to 660 F. The skin is a metallic oxide only about 16-millionths of an inch thick which can be operated at 115 or 230 v ac.

E-C (electrical conducting) coatings are generally transparent, and either colorless or tinted with various degrees of blue. Washing with ordinary cleaners is said to have no ill effects.

Corning Glass Works, Corning, N. Y.

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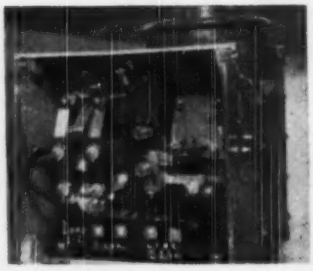


Cooling-Water Control

BY ADJUSTING the Esto water control to the water flow which water-cooled, electrically-operated equipment requires, possibility of overheating is said to be eliminated. If the water supply fails, a weighted lever falls to open the circuit. A relay stops the equipment or sounds an alarm, or both. It may be used with air compressors, vacuum pumps and similar equipment.

All types are standard 1-in. size which will pass about 30 gpm, although larger sizes may be specially made. Operation is from 25 or 60 cycles, 110 v to 600 v.

Electro Chemical Supply & Engineering Co, 750 Broad St, Emmaus (Allentown), Pa.

•

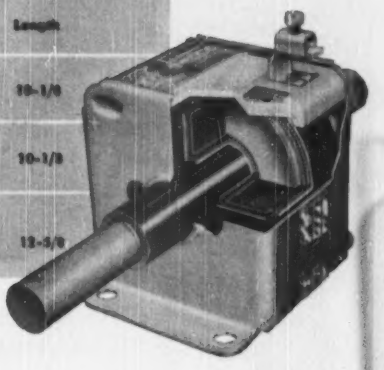
Electric Winch

MOBILE LIFTING and pulling power at construction work or for materials handling is provided by a portable electric winch.

The Tugger is a drum-and-cable winch available in six models and capacities with either single or 3-ph dual voltage motors. It can furnish a line pull of from 500 to 1,500 lb at speeds ranging from 55 to 220 fpm. Double reduction spur gears convert the output of a high torque, repulsion-

YOU CAN BE **SURE**.. IF IT'S
Westinghouse

Lighter...			Smaller...		
Primary Amperes	Secondary Amperes	Weight Pounds	Sizes in Inches Height	Width	Length
200	5	6	4	3-9/16	10-1/8
400	5	7	4	3-9/16	10-1/8
200-200 3-wire	5	7	4	3-9/16	13-5/8



NEW
"MR" CURRENT TRANSFORMER

It's smaller... fits smaller meter boxes—mounted separately it requires minimum space. Simplifies switchboard and panelboard installations, too.

It's lighter... easier to handle and install.

It costs less... save up to ⅓ on initial cost alone

Here's why... a new Hipersil® oriented core steel, and small through-type primary conductors make construction small, light and economical. Ask your Westinghouse representative for complete information, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70554

Westinghouse
CURRENT TRANSFORMERS

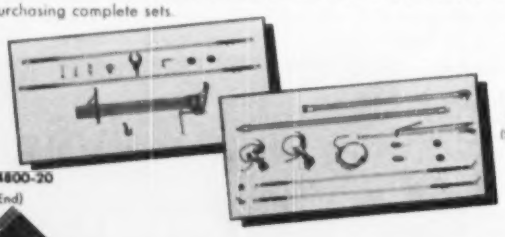
CHANCE Aluminum Fitted HOT LINE TOOLS

Complete Sets

for any Live Line Maintenance Job make selection easy and save you money!

There is a Chance Hot Line Tool Set to handle any live line maintenance job—three phase, or single phase, on straight line or dead end—from 4,000 volts on up. Chance Tool Sets provide the utmost in safety to linemen and meet all requirements for strong, lightweight, easy-to-operate tools.

Tool Set M4800-15, pictured above, contains all equipment needed for making pole changes, cross arm changes, and insulator changes on three phase construction. Other sets, with fewer tools, for changing insulators and making pole changes on single phase ridge pin construction; and for making dead end insulator changes on either poles or cross arms, are also available. Sets may be purchased complete, or as separate items. You can save money and simplify your buying by purchasing complete sets.



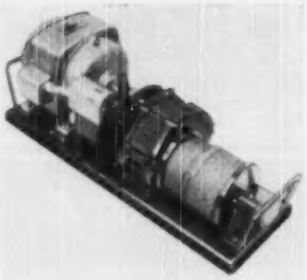
Tool Set M4800-20 (Dead End)

Tool Set M4800-14 (Single Phase)

ABC INDUSTRIES

A. B. CHANCE CO.

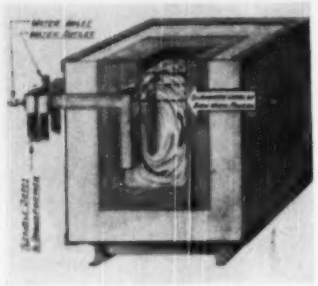
CENTRALIA, MISSOURI • SAN FRANCISCO, CALIFORNIA



induction motor to a constant speed and power ratio on the drum. A lever handle controls both the mechanical brake and the reversing switch on the motor.

St. Anthony Machine Products Co, 2424 E. Franklin Ave, Minneapolis 6, Minn.

•



Heat Treating Furnace

SUBMERGED-ELECTRODE furnaces are recommended by the manufacturer for use with salt baths operating at temperatures from 1,700 to 2,400 F. Specific applications of the furnace include baths for annealing and hardening stainless steel, and heating for forging and brazing.

The electrodes are closely spaced to produce electrodynamic stirring, said to give a temperature uniformity within 5 F. Because the electrodes are submerged, they are not exposed to severe oxidation, occurring at and above the bath surface, to cut down electrode life.

The furnaces are available in the range from 10 kw to 1,600 kw.

Ajax Electric Co, Inc, Frankford Ave, Philadelphia 23, Pa.

•

Utility Transformer

A TRANSFORMER has been developed which can be used for thawing frozen water pipes, soldering, brazing, and similar applications. Transformer rating is 1 kva, and it is designed for 110-120 v, 60 c, transforming to about 4, 8, and 12 v.

Heating pliers used with the trans-

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

IT TAKES A BALL AND TWO JEWELS FOR *Lowest Meter Maintenance**

They are the time-proven combination of special alloys and jewels . . . resulting in a meter bearing with the lowest friction and longest life. Your own records have proved it!

You *completely* forget lubrication and periodic bearing replacement. Mechanical adjustments are eliminated. Precision construction insures centering of the disc in the air gap.

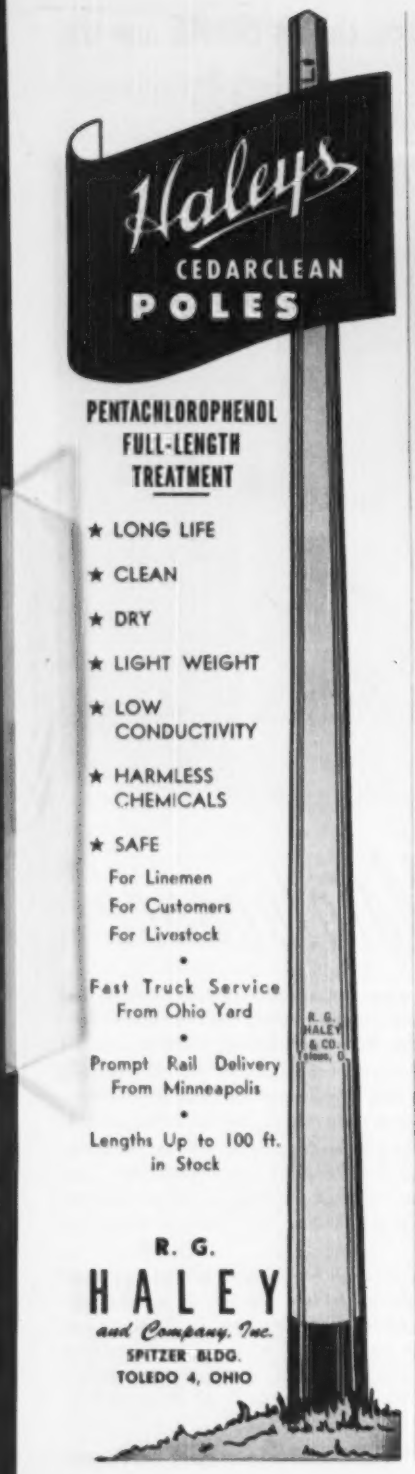
This proven combination saves money every year the meter is in service. No other meter bearing is so dependable . . . so free from friction and wear. Even under extreme overload, the normal action of the bearing and moving element is unimpaired.

You'll find this reputation for low-cost metering proved by your own records and by the records of other power companies. Get *all* the facts. Call your nearest Westinghouse office or write for the new booklet "What It Takes for Long-time, Low-cost Metering", B-4665. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-40369

**Westinghouse METERS*

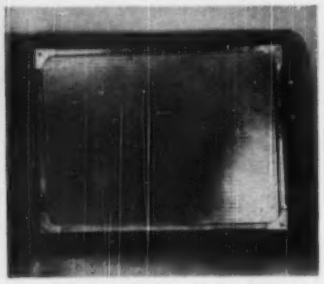
A VITAL PART OF LONG-TIME, LOW-COST METERING



former begin heating when the work is touched, completing the secondary circuit. Fifteen-foot leads are used on the one-hand-operated pliers. Electrode replacement is said to be the only maintenance required.

Sorgel Electric Co, 838 W. National Ave, Milwaukee 4, Wis.

•



GLASSHEAT PANEL — Designed for dens, bathrooms and other small rooms is the Junior radiant glass heat panel consuming 630 w. By combining a 1,000-w panel with this smaller size, it is possible to more exactly meet heating requirements of outsize rooms.

Continental Radiant Glass Heating Corp, 1 E. 35th St, New York 16, N. Y.

•

Chemical Motors

A NEW CSP Life-Line motor, designed for use where corrosive fumes and liquids are encountered, has bronze split-hub, clamp-type blowers for corrosion resistance. Rotating Neoprene slingers on the shafts between rear brackets and hoods are used to prevent entrance of dirt or liquid into the bearing housings. Company reports that no lubrication is needed for the life of the bearings.

Westinghouse Electric Corp, P.O. Box 2099, Pittsburgh 30, Pa.

MORE NEW PRODUCTS
about which you should know

TAL BENDER, INC, MILWAUKEE 2, WIS., is manufacturing a **bending device** for making uniform bends or offsets in ½ and ¾-in. rigid, EMT thinwall or aluminum conduit. . . . THE EDWIN F. GUTH CO, 2615 WASHINGTON AVE, ST. LOUIS, MO., is producing the Luminous **Fluorescent** equipped with Polyestyrene plastic or Albalite glass side panels for 40-w, 4 and 8-ft slimline lamps.

HUNTER FAN AND VENTILATING CO, 400 S. FRONT ST, MEMPHIS, TENN., offers a two-speed, electrically reversible **window fan** for small homes; air delivery rating is 2,500 cfm. . . . INDUSTRIAL PRODUCTS CO, PHILADELPHIA 33, PA., has a **welding shield** incorporating a form of periscope for getting into offset or close places.

WESTINGHOUSE ELECTRIC CORP, BOX 2099, PITTSBURGH 30, PA., is manufacturing a bare lamp fluorescent **luminaire** designed for direct-lighting commercial applications where exposed light sources are permissible; can be surface or suspension mounted. . . .

SPECIALTIES, INC, SKUNKS MISERY RD, SYOSSET, L. I., N. Y., has designed an **integrator motor** for applications requiring the time integral of a dc voltage between plus and minus 15 v.

UNION CARBIDE AND CARBON CORP, NATIONAL CARBON DIV, 30 E 42ND ST, NEW YORK 17, N. Y., has developed an "inside out" **flashlight battery** whose carbon cell is said not to perforate, leak, corrode, or swell as did some zinc containers . . . THE CHARLES L. JARVIS CO, MIDDLETOWN, CONN., has announced a bench-type torque-driven Torquomatic for **tapping and drilling** operations.

EASTMAN KODAK CO, ROCHESTER 4, N. Y., has designed a **contour projector** with a 14-in. screen for small instruments, etc; lens magnification to 100X. . . . NOBLE & STANTON, 1042 BROADWAY, BEDFORD, OHIO, is making the "Super-Slugger" **electric hammer** for channeling-in in concrete, star-drilling entry holes for conduit or mounting holes for anchors and electrical equipment.

BARBER-COLMAN CO, ROCKFORD, ILL., has the Dyab **motor** of 0.004 hp for use with measuring instruments or positioning mechanisms requiring a reversible motor. . . . THE AUTOCALL CO, SHELBY, OHIO, is producing the HHA **relay** for high-speed (6-8 milliseconds) use; coils furnished for 24 to 150 v dc.

LOVEJOY FLEXIBLE COUPLING CO, 5001 W. LAKE ST, CHICAGO 44, ILL., has designed Types C and H **couplings** for use on motor-driven generators, pulverizers, pumps, compressors, and other machinery of 50 to 1,000 hp. . . . POWER BALL OIL CO, INC, 911 HUGER ST, COLUMBIA, S. C., is manufacturing an **oil bracer** said to boost lubricity and performance life of oils or greases to which it is added; reportedly useable with generators, heavy machinery, instruments, trucks, etc.

THE DOW CHEMICAL CO, MIDLAND, MICH., has developed chemical **brush killers** containing new type ester formulations said to be effective on a wider variety of brush and weeds, and be less volatile, than previous materials. The products are called Esteron Brush Killer and Esteron 245.

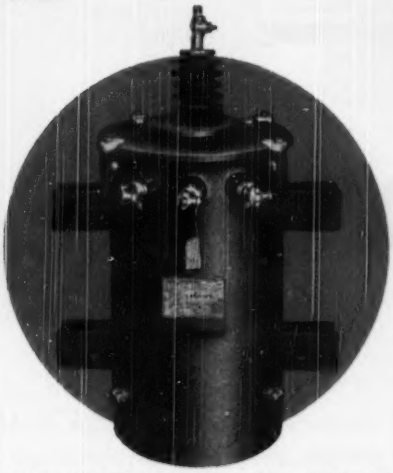
Wagner Rural Line Transformer Service

Expert RECONDITIONING
GENUINE PARTS

All transformer repair parts are Genuine Wagner Parts and when replacing

Wagner Electric Corporation, pioneer builder of transformers, offers a complete line of repair parts and reconditioning service for Wagner Rural Line Transformers — Genuine Repair Parts for "on-the-spot repairs"... or "Factory Reconditioning Service" for transformers that need a complete overhauling... just send them to the nearest Wagner Service Branch.

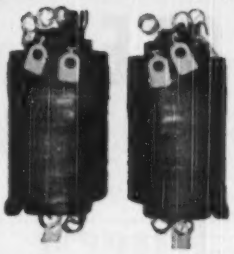
Take advantage of this service — check your Rural Line Transformers and keep them at top efficiency with Wagner Repair Parts and Expert Reconditioning Service.



COMPLETE REBUILDING SERVICE

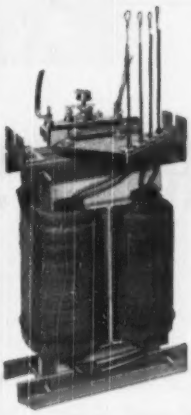
This service consists of cleaning and painting of transformer, installing all new gaskets, installing new factory-wound coils and insulation and a thorough factory test. A one year warranty against defective material and workmanship applies on all transformer rebuilding jobs. Ship transformer to us prepaid and we will pay return freight charges. Oil, broken or missing bushings, or other major parts are extra. If the transformer does not require complete rebuilding, repairs will be made on a time and material basis.

Wagner Electric Corporation
6456 Plymouth Ave., St. Louis 14, Mo.



COILS AND INSULATION

A complete set of coils and all necessary insulation for mounting on your own core. A gasket kit is included.



GASKET KIT

A complete set of all composition gaskets used throughout the transformer.

NEW INTERIOR

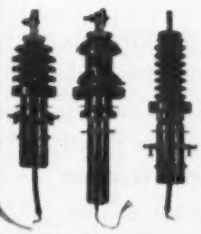
Consists of complete, new core-and-coils assembly with a terminal board or tap changer, with leads ready to install in your tank. A gasket kit is also included.

TRANSFORMER OIL 7N

Genuine Wagner 7N Transformer Oil. Available in 1, 3, 5, 20, 30 and 50 gallon containers.

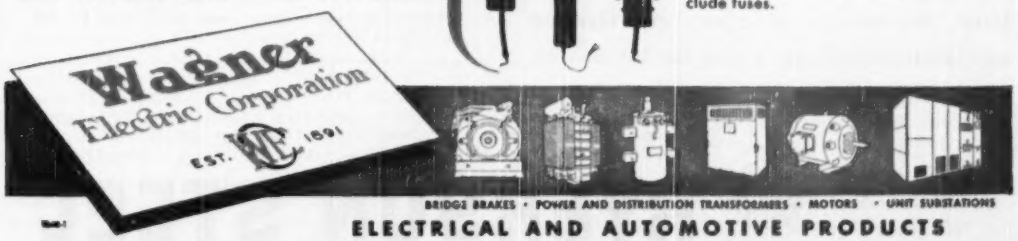
LOW VOLTAGE BUSHING ASSEMBLY

Includes porcelain bushing, composition gasket, solderless connector-type terminal and clamping device.



HIGH VOLTAGE BUSHING ASSEMBLIES

Available in various types to meet a wide range of requirements. They do not include fuses.



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Call RYERSON

Wherever you are in America, there's a well stocked Ryerson steel plant within quick shipping distance. From thirteen strategically located points, Ryerson carbon, stainless and alloy steels in thousands of kinds, shapes and sizes are ready for immediate delivery.

By carefully specifying and checking, we are able to certify to the consistently uniform high quality of our steels. And to help you select the type best suited to the job at hand, the services of experienced Ryerson specialists are always yours for the asking.

Widely diversified Ryerson stocks enable you to procure many steel requirements at the same time from the same source. One order—one invoice does the job. So save time, save paperwork and be sure of uniform quality. Call Ryerson when you need steel.

PRINCIPAL PRODUCTS

BARS—Carbon & alloy, hot rolled & cold finished

SHAFTING—Cold finished, ground and polished, etc.

STRUCTURALS—Channels, angles, beams, etc.

TUBING—Seamless & welded mechanical & boiler tubes

STAINLESS—Allegheny plates, sheets, bars, tubing, etc.

PLATES—Sheared & U. M., Inland 4-Way Floor Plate

SHEETS—Hot & cold rolled, many types & coatings

MACHINERY & TOOLS—For metal working

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON
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CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

RYERSON CERTIFIED STEELS

RYERSON STEEL

NEWS ABOUT PEOPLE

Karn, Campbell Named Consumers Power VP's

D. E. Karn has been elected first vice president of Consumers Power Co, Jackson, Mich., and J. H. Campbell has been named a vice president.

H. S. Richmond is now assistant general supervisor of sales and rates reporting to Vice President M. W. Arthur, who is in charge of this department. Richmond retains his position as director of employee relations.

D. E. KARN

Karn started in the steam heating department of Central Illinois Light Co, Peoria, in 1915. Seven months later he left that company to become superintendent of steam heating of Consumers at Grand Rapids. He went to Springfield (Ill.) Gas & Electric Co on a special assignment in the summer of 1918 but resumed his position at Grand Rapids the next year and took on the additional responsibilities of power engineer.

In 1921, two years after his assignment to the rate department at Consumers headquarters in Jackson, Karn was made assistant to the general manager. When the customer ownership plan of selling preferred stock was inaugurated in 1924 he was placed in charge of this activity.

Karn became division manager at Kalamazoo in 1927 and assistant general manager in Jackson four years later. In 1933 he was made vice president and general manager.

Campbell is a son of the late B. G. Campbell, for many years manager of Consumers' Pontiac division. The son

J. H. CAMPBELL

joined Consumers in 1933 as a power and lighting sales engineer in the Lansing division. From 1939 to 1942 he served as a power sales engineer for Ohio Edison Co in Youngstown.

In 1946, after his return from military service, Campbell rejoined Consumers as assistant to the Grand Rapids division manager. He was made division manager in 1947 and assistant to the president in 1949.

•

Arthur L. Dow, Paris, Tenn., has been elected president of the Tennessee Valley Public Power Association. He succeeds S. R. Finley, Chattanooga, who served as the association's first president. Other officers named include **M. C. Stewart**, Fort Payne, Ala., as secretary-treasurer.

Raymond C. Dunn has been appointed manager of the rural lines department of Graybar Electric Co. His headquarters will be in Chicago. Dunn, who has been manager of outside construction sales for Graybar at Cincinnati, succeeds **George Vana**, retiring after 34 years of service. Dunn joined Graybar's Nashville organization in 1940 after 12 years with utilities in Tennessee and Mississippi.

H. E. Bailey, chairman of Grays Harbor Public Utility District, Aberdeen, Wash., has resigned in protest against sale of a small issue of PUD bonds without public bidding. The other two commissioners had approved the sale. No call for bids is required by state law.

Combustion Engineering Picks 2 Vice Presidents

H. G. Ebdon and William P. E. Ainsworth have been elected vice presidents of Combustion Engineering-Superheater, Inc, New York.

Ebdon joined the company in 1917 and since 1925 has served successively as manager of the proposition department; sales engineer, New York district office; and assistant general sales manager. In 1941 he was appointed general sales manager of boilers and related equipment. He will continue in the latter capacity, working in association with Donald S. Walker, vice president and director of sales.

H. G. EBDON

Ainsworth went to Combustion in 1921 as a service engineer and later became manager of the service and erection department. In 1939 he was appointed general purchasing agent and in 1942 production manager as well. As a vice president he will continue in charge of production and purchasing for the company's six American manufacturing plants.

•

Richard D. Furber has been appointed director of a new public information and advertising department in the executive branch of Northern States Power Co, Minneapolis. **T. H. Kettle** will continue as advertising manager, in charge of both sales and public information advertising. Furber, an electrical engineer who joined the company in 1928, has worked in the sub-

IT MEANS MORE

when BARTLETT is on your LINE CLEARANCE job!

IT means having a nationally-known company on the job . . . a company whose ability and experience people respect and have confidence in. Bartlett men gain your customers' good will; they assure good work and good public relations . . . double protection for you. Bartlett is tops in equipment, in knowledge, in trained man-power. You can't ask for more.

MORE and more utility companies retain Bartlett for line clearance; you can see why for yourself just by calling our local office in your community, or write direct for a representative to call.

BARTLETT SERVICE MEANS

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- TRAINED MEN
- BEST EQUIPMENT
- CAREFUL WORK
- PROMPT SERVICE
- ECONOMY
- RESPONSIBILITY

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TREE EXPERTS

The Bartlett Way

HOME OFFICE: RESEARCH LABORATORIES & EXPERIMENTAL GROUNDS, STAMFORD, CONN.

LOCAL OFFICES: Rutland, Windsor, Vt.; Milford, Peterboro, Rochester, N. H.; Cambridge, Framingham, Manchester, Osterville, Pittsfield, Mass.; Providence, R. I.; Danbury, Hartford, New Canaan, New Haven, Stamford, Westport, Conn.; Islip, Kingston, Monroe, Middletown, New York, Peekskill, Southampton, Syracuse, Westbury, White Plains, N. Y.; Bernardsville, Morristown, Orange, N. J.; Chambersburg, Paoli, Philadelphia (Cynwyd), York, Pa.; Wilmington, Del.; Bethesda, Easton, Towson, Md.; Ashland, Ky.; Lancaster, Portsmouth, Ohio; Charlottesville, Lynchburg, Roanoke, Va.; Bluefield, Charleston, Huntington, W. Va.; Kingsport, Tenn.

urban, municipal, and resale departments. He has been active in matters relating to Missouri Valley development and has represented the utility in contacts with government agencies.

•

McEachern Appointed VP by Boston Edison Co

Arthur J. McEachern has been appointed vice president of Boston Edison Co in charge of industrial relations.

ARTHUR J. McEACHERN

Since 1942 he has been manager of industrial relations.

Oscar B. Benson has been named assistant vice president of Boston Edison. He has been assistant manager of industrial relations since 1943. Earlier he served as assistant chief of electrical operations and substations.

McEachern began work with Boston Edison 44 years ago as a messenger boy. For many years he was connected with the purchasing department and served as assistant purchasing agent. In 1940 he became assistant industrial relations manager.

•

George Hamburger, of Copperweld Steel Co's wire and cable division, has been appointed manager of communication sales for the entire United States. He has been manager of Copperweld's St. Louis district. Before that he was with Delta Star Electric Co, where he specialized in the high tension and equipment field. He also has been a cable engineer for Chase Brass & Copper Co and Kennecott Wire & Cable Co.

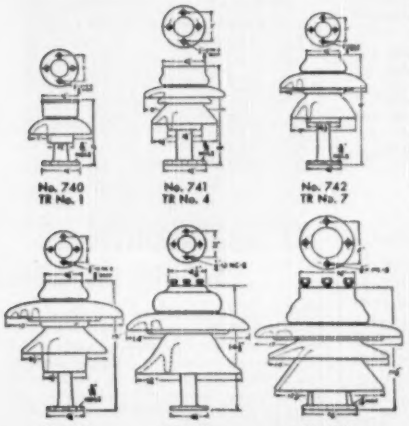
C. E. Burke has been named manager of sales of General Electric Co's Specialty Transformer and Ballast Divisions at Fort Wayne, Ind. He has been manager of the distribution transformer sales division for the company's Transformer and Allied Product Divisions since 1945. Earlier he held engi-

ANOTHER VICTOR INSULATOR THAT SAVES AS IT SERVES

Left: VICTOR switch and bus insulators on a switching structure in the South.

Install VICTOR Switch and Bus Insulators and see how

TROUBLE-FREE PERFORMANCE REALLY PAYS OFF!



No. 740 TR No. 1 — No. 741 TR No. 4 — No. 742 TR No. 7

No. 744 TR No. 10 — No. 723 (2 unit stack) TR No. 16 — No. 729 (stacking unit) TR No. 140

THE number of service-years built into any switch and bus insulator can be determined *only by actual performance data*—data obtained from *all* types of station installations subject to *all* kinds of conditions. And, because of their rugged, heavy-duty construction, that is where VICTOR switch and bus insulators rate *high!* Facts prove VICTOR switch and bus insulators *retain* their original high standards even after many years of severe service. This means *fewer* replacements and *lower* maintenance costs. Find out how much trouble-free performance can *save* you—*standardize* on VICTOR switch and bus insulators.

***Ready soon!** A new condensed VICTOR Catalog for handy reference. Write us now and reserve your copy.*

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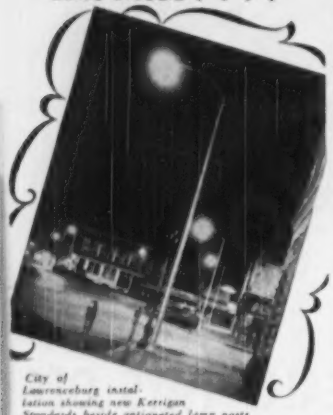
INSULATORS Inc.
VICTOR, NEW YORK

Look for this trade mark of enduring service

Your Town

can Have Beautiful WELL-LIGHTED STREETS with KERRIGAN STANDARDS Like These . . . .



City of Lawrenceburg installation showing new Kerrigan Standards beside antiquated lamp posts

. . . . With KERRIGAN Weldforged LIGHTING STANDARDS, designed and engineered to make night-driving in your town just like day . . . Standards that meet the highest engineering standards for highway and street lighting.

. . . . Notice what one progressive Tennessee town did to light its streets; then check the Kerrigan specifications below to see how much more Kerrigan Standards offer you.

- ✓ Shafts (20', 25', & 30') and Mast Arms (4', 6', 8', 10', 12' & 15') to conform to I.E.S. recommendations.
- ✓ Continuous Tapered Octagon shafts from open hearth steel.
- ✓ Heavy steel construction for maximum strength.
- ✓ Detachable mast arms, brackets, and transformer bases for easy installation and maintenance.
- ✓ Ornamental scroll braces for beauty AND strength.
- ✓ Mechanical priming at factory with red oxide (inside and out) for longer life. Finish coat can be easily applied after standards are in place.
- ✓ Special designs to meet ANY and ALL special requirements. CONSULT THE KERRIGAN ENGINEERING DEPARTMENT.

WRITE NOW (on your letterhead please) for your **FREE COPY** of our Kerrigan Lighting Standard booklet AIA which gives you detailed specifications and catalog information.

— Write —

KERRIGAN IRON WORKS, Inc.

General Sales Office

274 MADISON AVENUE, N. Y. C.

neering and sales posts both in district sales and in the general office. From 1943 to 1945 he was assistant manager of the sales organization he now will head.

•

Canadian Westinghouse Elects Rogge President

Herbert H. Rogge, who has spent 28 years in the electrical industry in this country and abroad, has been elected president of Canadian Westinghouse Co, Ltd.

At the same time Harold A. Cooch, who has been president, was elected chairman to succeed John R. Read. Read is retiring after 50 years of service.

Rogge joined the American Westinghouse company as supervisor of rates in Brooklyn, N. Y., in 1922. Four years later he was transferred to Westinghouse Electric International Co as special representative in the Philippines, with headquarters in Manila. Later he opened new offices for the company at Soerabaya, Java; Singapore; the Straits Settlements; Federated Malay States; and Bangkok, Siam, and traveled in Europe, Latin America, and the Caribbean.

In 1939 he went to the parent Westinghouse Electric Corp headquarters at Pittsburgh to head a new agency and specialties division, formed to coordinate manufacturing and sales of specialty products in the consumer and industrial fields. In 1940 he was named manager of the Westinghouse office in Washington, D. C., and in 1944 was elected vice president and given responsibility for Westinghouse sales in the New England, Middle Atlantic, and Eastern states. Most recently he has been executive vice president of Canadian Westinghouse.

•

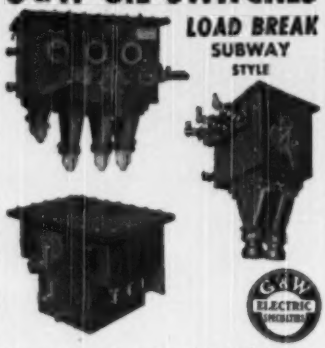
Lt Col Herbert C. Gee, deputy chief of civil works for flood control in the office of the Army Chief of Engineers since October, 1947, has resigned from the Army to enter private engineering practice in West Palm Beach, Fla. His successor is **Lt Col Wright Hiatt** of the staff of the Engineer School, Fort Belvoir, Va. Colonel Gee has figured prominently in Corps of Engineers testimony before Congress on multi-purpose flood control developments.

C. F. Harwood and **Frank D. Shumate** have retired from Worthington Pump & Machinery Corp after more than 40 years' service each. Harwood has been associated with the company's condenser business and sale of power plant equipment since he joined the condenser department in 1909. In 1945 he be-

Sectionalize with

G&W OIL SWITCHES

LOAD BREAK SUBWAY STYLE



For safe, speedy sectionalization of cable circuits install load break subway oil switches. If cable trouble occurs, sections can be isolated quickly and circuits re-routed to restore service in the area affected. Load break disconnection is accomplished by manual (or automatic) operation of an external lever. G & W Type "RA" multiple circuit oil switches are solving many sectionalizing problems. Their simple, sturdy design requires minimum maintenance. They save space and provide system flexibility in a simple, economical manner.

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came assistant to the vice president. Shumate joined Worthington in 1906 as a sales engineer in the Chicago district office. Most of his work has been in condenser and power plant equipment sales, as engineer in the steam power division, until his appointment as assistant manager of the condenser section.

Fred I. Biggs has been named to the newly created position of division engineer for the Ridgway Works of Elliott Co, Jeannette, Pa. He joined the company in 1933 and served successively in the electric power sales department at Ridgway, as a sales engineer in the Philadelphia district office, and then in the Ridgway sales department again. He switched to product engineering in 1943 and became section engineer in ac generators.

Clarence M. King, former assistant treasurer and assistant secretary of Minnesota Mining & Manufacturing Co, St. Paul, has been named treasurer of the company. He will continue as assistant secretary. **George Schoettly** and **Edwin H. Church** are new assistant treasurers.

OBITUARY

Irving H. Reynolds, 88, retired Allis-Chalmers Manufacturing Co executive, died April 19 in Milwaukee. Reynolds joined the old E. P. Allis Co, forerunner of Allis-Chalmers, in 1884. In 1886 he and his uncle, Edwin Reynolds, designed the first triple-expansion pumping engine of the inverted type for a Milwaukee pumping station. Later he served A-C as assistant chief engineer and general superintendent, chief engineer, manager and chief engineer of the engine department, and advisory engineer. He retired in 1935.

John G. Farrar, 60, former comptroller of General Electric Co, died in Charlottesville, Va., April 26. He joined GE as a draftsman in 1907, became comptroller in 1944, and resigned in 1946 because of ill health. Farrar instituted the business training course now used by the company.

George M. Eckley, 63-year-old retired district manager of Appalachian Electric Power Co, died in Beckley, W. Va., April 22. Eckley had been manager of the Beckley district since he joined the firm in 1926. Earlier he had been with West Virginia Light & Traction Co in South Charleston.

Karl H. Otto, 53, treasurer of Missouri Power & Light Co, died in Jefferson City, Mo., April 23 following a heart attack. He had been a director of the company for 24 years.

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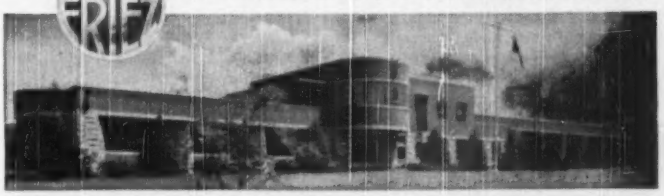

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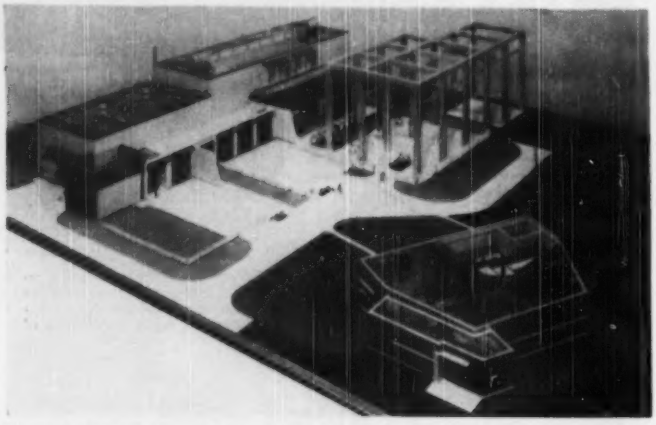

"AERIAL" VIEW of a model of a new high-capacity short-circuit testing station which is being constructed by General Electric Co near its switchgear plant in Philadelphia

Switchgear Equipment Testing Station Planned by GE Called Largest of Type

A new high-capacity short-circuit testing station, which General Electric Co claims is the largest of its type in the world, is being built by the company near its switchgear plant in Philadelphia. The new station's location will facilitate test and design work.

The station will be used for testing switchgear equipment, formerly sent for test to the company's facilities in Schenectady, N. Y. It will be capable of delivering 3 million kva at generator voltages on a 3-phase symmetrical basis and of testing power circuit breakers and other switchgear apparatus at voltages up to and including 440 kv.

Included in the facilities will be a test building and control building containing a total of 51,000 sq ft of floor space and a high-voltage yard. The test building will contain a generator room enclosing the two main generators, reactors and protective switchgear, and a large assembly room.

The high-voltage yard will provide voltages up to 440 kv. Observation booths in the yard will permit close observance of destructive tests without danger to personnel.

Present estimates indicate that the complete plant will be in service in the spring of 1951.

•

1st Quarter Profits Hit Sylvania Peacetime High

Sylvania Electric Co's first quarter sales and earnings were the best the company has had in any peacetime initial quarter, Pres Don G. Mitchell told the annual stockholder meeting.

Earnings of $1,225,844 in the first quarter of 1950 were equal to 77¢ a share on the outstanding common stock after deducting dividends of $1 a share on the $4 cumulative preferred. In the corresponding period a year ago earnings were $1,176,815, the equivalent of 74¢ a share.

Sales of $29,347,911 compare with $27,108,895 in the first quarter of 1949. Orders for the first three months of this year were nearly 30% ahead of shipments. Though some of this backlog of orders is expected to melt away under normally smaller seasonal demand, in some lines, particularly receiving tubes and picture tubes, demand is expected to keep production facilities running at capacity levels for some time.

Sylvania expects a less severe seasonal decline in the second quarter than developed in the same period last year, Mitchell said.

•

4 Gray Finishes Adopted For Equipment by ASA

American Standards Association has announced the adoption of four accurately defined grays as standard finishes. General acceptance of the new standard entitled "Gray Finishes for Industrial Apparatus and Equipment" (ASA Z55.1-1950) by manufacturers and purchasers is expected to reduce the cost of finishes and finishing, make it easier to specify and to match grays, and to produce color harmony of machines.

Value of the simplification is reportedly shown by the experience of several manufacturers of electrical equipment who had to stock more than 100 different shades of gray to satisfy customers. One manufacturer reported using 60 shades on a single type of equipment.

Each of the four grays may be specified by name or number. The numbers indicate the approximate degree of lightness and darkness. Munsell notation for hue, value, and chroma identifies each color. Color chips of the standard grays, used as masters, are also available from Association headquarters 70 E 45th St., New York 17, N. Y.

MANUFACTURING BRIEFS

Factory sales of standard-size household washers totaled 423,802 in March, 2.3% below the record high of 433,919 attained in September, 1948, according to the American Home Laundry Manufacturers Association. March sales were 20.4% above February, 1950, and 66% above March, 1949.

Television receiver production for the first quarter of 1950 was 21% higher than in the previous peak period, the last quarter of 1949, and more than three times the output in the first quarter of 1949, the Radio Manufac-

turers Association reports. Set manufacturers reporting to the association produced 1,227,930 receivers in the quarter.

The third of four aluminum potlines at Reynolds Metals Co's Jones Mill plant near Hot Springs, Ark., has gone into operation, giving the plant a total daily capacity of 300,000 lb of aluminum ingots. The last potline will go into production early this month, as soon as a second turbo generator is ready at Arkansas Power & Light Co's Lake Catherine steam generating plant.

"Birth of a Salesman," a two-act, 26-scene General Electric Co play featuring Broadway and Hollywood actors, is being presented to GE major appliance retailers across the country. One of the most elaborate sales training projects ever attempted at the dealer level, the $500,000 production is designed to teach sound merchandising through hard selling.

Orangeburg Manufacturing Corp. maker of Orangeburg electrical conduit, sewer pipe, and underfloor duct, has moved its executive offices from 292 Madison Ave, to 488 Madison Ave, New York 17, N. Y. The move, which has more than tripled the company's office space, was made because of increased out-of-town business.

The name of the "K-C Motors" line made by the Kingston-Conley Division of the Hoover Co, North Canton, Ohio, has been changed to "Hoover Electric Motors." The change unifies under one name the line of Hoover products. The Kingston-Conley operation in North Plainfield, N. J., was incorporated into Hoover about a year ago.

Sylvania Electric Products, Inc. has consolidated its New York area offices in new headquarters at 1740 Broadway, New York 19. In the new office are the following divisions and departments: executive and administration, accounting, advertising, industrial relations, legal, purchasing, New York sales, and international.

"Electrified Farming," fifth motion picture in General Electric Co's "More Power to the American Farmer" series, now has been released. The 25-minute, 16-mm, sound color film demonstrates how properly applied electricity can lighten farm chores.

The Blackburn Specialty Co. Cleveland, has changed its name to Blaco Manufacturing Co, and products manufactured will be sold under the new trade name Blaco.

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STANDARD • SPECIAL
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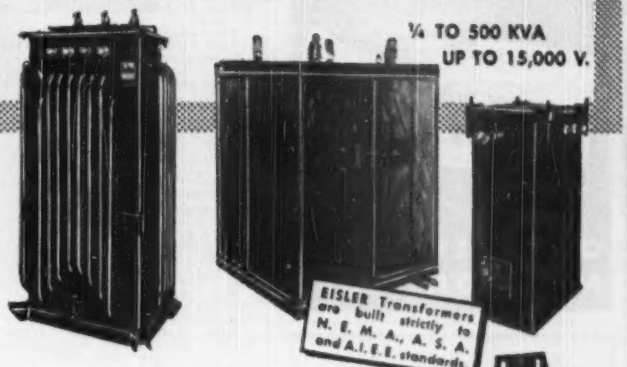

In addition to the manufacture of standard transformers the Eisler organization is especially well adapted to design and build transformers to the customer's specifications when departure from standard construction is desired. Send in your specification for quotations.

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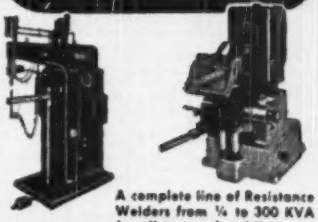

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No. R-22. For amerductor, aluminum or galvanized steel strand connections to similar conductors.

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These Sherman Jumper Clamps are preferred by electrical engineers because they are quickly installed, make a lasting, dependable connection, accommodate a large range of wire sizes—and are low in cost.

High grade bronze, with heavy, ribbed construction. Unique interlocking design permits installation without removing bolt. Approved for R.E.A. rural lines. Write for Bulletin 25 and free sample.

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NEW ELECTRICAL CONSTRUCTION

A weekly selection of U. S. electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is indicated or implied

UTILITIES

Proposed Construction

California—Bureau Reclamation, Dpt. Interior, Elverta, 230-kilovolt transmission lines, Shasta-Tracy Nos. 1 and 2, Rio Vista-Tracy Section, Central Valley Proj. between Rio Vista and Tracy, Spec. 2979. L. N. McClellan, Bldg. 1-A, Denver Federal Center, Denver, Colo., ch. engr.

California—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., two 115,000 volt circuit breakers for Tracy switchyard, Central Valley Proj., Spec. 2991. L. N. McClellan, ch. engr.

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, furnishing, del. f.o.b. cars shipping point or f.o.b. cars Wild's Spur, grounding transformer for Estes Switchyard, Colorado-Big Thompson Proj., Spec. 3003. L. N. McClellan, ch. engr.

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo. circuit breakers, switches, disconnecting switches, metering outfits for Limon sub-station, Colorado-Big Thompson Proj., Spec. R7-113 (Region 7). L. N. McClellan, ch. engr.

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, furnishing, del. f.o.b. cars shipping point or f.o.b. cars Campion, turbines for Pole Hill Power Plant and Flatiron Power Plant, Colorado-Big Thompson Proj., Spec. 2996. L. N. McClellan, ch. engr.

Fla., Tampa—W. D. A. E., c/o Wm. O. Sparklin, archt., 424 S. MacDill Ave., radio and television station, $100,000.

Kan., Axtell—Nemaa-Marshall Rural Electric Assn., Axtell, warehouse and shop for rural power dist. $80,000. Cayton & Murray, Abilene, archt.

Miss., Crystal Springs—Mississippi Power & Light Co., 144 S. Congress St., Jackson, sub-station adn. **$175,000.**

Nebraska—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., controlling station supervisory control and telemetering switchboard and equip. and carrier-current equip. for supervisory control and selective and continuous telemetering for Gering and Sidnay substation and Yoder Tap, Missouri River Basin Proj. Transmission Div., Spec. 2992.

Nebraska—Dawson County Public Power Dist., Lexington, 257.6 mi. rural distr. lines, Buffalo, Custer and Dawson Counties. $300,000. Raymond H. Reed & Co., Columbus, engr.

O., Painesville—Diamond Alkali Co., M. O. Kirp, genl. mgr., Painesville, expand power plant, rehabilitate chromate plant, build magnesium oxide plant, add three new units in chlorine department, expand and modernize washing soda dept., build metasilicate plant, remodel research bldg., Fairport, near here.

Pa., Pittsburgh—General Appliances, Inc., c/o General Electric Co., 21 Penn Ave., warehouse, Hunting, Larson & Dunnels, 1150 Century Bldg., archts.

Tenn., Oak Ridge—U. S. Atomic Energy Comm., P. O. Box E, Isotope Research and Semi-Workers, Bldg. 2, Inv. No. 401-50-15A. Plans deposit $100.

Vermont—Washington Electric Co-operative, Barre, 68 mi. rural distr. lines and sys. imprvs., Washington Co. **$187,000.**

Washington—Bureau Reclamation, Dpt. Interior, 202 N. 4 Ave., Yakima, 2.4 kv distr. line to Mile 815, Pumping Plant Roza Div., Yakima Proj., about 6 mi. northeast of Prosser, Spec. R1-82.

Low Bidders & Contracts Awarded

Arkansas—U. S. Eng., 300 Broadway, Little Rock, furnish main generator leads and switch gear for powerhouse at Bull Shoals Dam powerhouse, Cotter, from General Electric Co., 301 E. Markham St., Little Rock, **$179,982.**

Arkansas—Arkansas Valley Electric Co-operative Corp., Ozark, 171 rural distr. lines, Franklin Co., to Lane Constr. Co., Little Rock, **$190,998.** Est. $210,000. Bids 4/12.

Missouri—Sho-Me Power Corp., R. D. Hjelmaen, asst. mgr., Mar. 17, 45.4 mi. 69 KV transmission lines, H frame, Willow Springs to Mansfield, from Reinhart & Donovan Co., Commercial Exchange Bldg., Oklahoma City, Okla., **$276,091***** 30 sub-station transformers ranging from 250 KVA to 1000KVA in size, from Standard Transformer Co., 5579 Pershing Ave., St. Louis, Zone 12, **$102,320*****9 outdoor sub-stations, incl. steel, switchgear, protective devices except oil circuit breakers and busses, Proj. 59-Cole, from A. G. Miller, Dwight Bldg., Kansas City, Mo., **$166,359.**

North Carolina—Randolph Electric Membership Corp., Asheboro, Apr. 13, 111.2 mi. rural distr. lines, incl. 80.1 mi. of conversion Randolph, Alamance, Chatham, Montgomery and Moore Counties, from F. D. Cline Constr. Co., Box 349, Raleigh. **$118,607.**

Oregon—U. S. Eng., 19 E. Poplar St., Walla Walla, Wash., Apr. 5, installing electrical and misc. items at McNary Dam, Serial No. CIVENG 45-104-50-92, from Michiel's Electric, Hermiston, **$193,320.**

South Carolina—Lynches River Electric Corp., Inc., Fageland, Apr. 19, 71.7 mi. rural distr. lines, Lancaster, Kershaw, and Chesterfield Counties, from F. J. Seastrunk Electric Co., 1731 Harden St., Columbia. **$83,732.**

Tex., Tulia—City, electric light and power plant imprvs., extens., own forces. $75,000.

Va., Windsor—The Community Electric Co-operative, Windsor, warehouse and office, to Reid & Hope, Suffolk, **$74,717.**

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Conn., Bridgeport—State, Raymond S. Thatcher, comptroller State Capitol, Hartford, plans by Frederick J. Dixon, 952 Main St., 2 story, bamnt., 130,000 sq. ft., brick, steel vocational-technical school, auditorium, gymnasium, Bullard Haven Technical. **$3,395,000.**

Ill., Chicago—University of Chicago, 59 and Ellis Sts., Zone 39, plans by Schmidt, Garden & Erikson, 104 S. Michigan Ave., Zone 3, 4 story cancer research hospital. **$3,500,000.**

Ill., Chicago—Great Atlantic & Pacific Tea Co., 424 W. 48 St., Zone 32, 175,000 sq. ft. steel brick, concrete bakery. $1,-000,000. Central Mfg. Dist., 38 S. Dearborn St., Zone 3, archts. A. Epstein & Sons Co., 2011 W. Pershing St., Zone 9, engrs.

N. C., Raleigh—Bd. Comrs. Wake Co., John P. Swain, chn., Raleigh, voted bonds, schools. **$4,000,000.**

Low Bidders & Contracts Awarded

Ky., Gabe—Tennessee Gas Transmission Co., Commerce Bldg., Houston, Tex., design and construction stripping plant to extract by products from natural gas, to Stone & Webster Eng. Corp., 49 Federal St., Boston, Mass. Approx. **$9,000,000-$12,000,000.**

N. C., Salisbury—Veterans Admin., Munitions Bldg., Wash. 25, D. C., Apr. 25, general contract, medical and surgical bldg., etc., from Curlett-Tompkins-Wunderlick, 907 16 St. N.W., Wash., D. C. **$11,634,626,** elevators and dumbwaiters, from Westinghouse Electric Corp., 40 Wall St., New York, N. Y. **$337,422.**

S. C., Camden—E. I. du Pont de Nemours & Co., Inc., duPont Bldg., Wilmington 98, Del. (2nd unit) 250x1,000 ft. "Orlon" yarn plant, own forces. To exceed **$2,300,000.**

BOOK REVIEWS

Electrical Meterman's Handbook. **Published by Edison Electric Institute, New York 17. 615 pages, illustrated. Price $4.90.**

This is a sixth edition of the handbook initiated in 1912 and, as before, the meter and service committee prepared it. Consequently there could be no more authoritative or competent a reference book. In no sense a textbook it should be helpful, however, in self-study because it does explain in non-mathematical terms how meters and instrument transformers function, how wired up, how installed, checked and tested. In addition to conventional metering there is discussion of telemetering, totalization, compensating and varhour metering. A whole section is devoted to wiring diagrams, others to installation, testing and reading practices and the tooling of the meter laboratory. These comprise the first 307 pages and the remaining 308 are devoted to the details of commercial types of meters offered by four manufacturers. There is a short bibliography. In short the new volume embraces about all the meterman would be likely to turn to a handbook to find. It's there and the index is well contrived to tell him where.

Application of the Electronic Valve in Radio Receivers and Amplifiers. **By B. G. Dammers et al. Distributed by Elsevier Book Co, Inc. New York 3. 415 pages, illustrated. Price $5.00.**

This is the English edition of Book IV in the Philips' Technical Library (Eindhoven, Holland). The original Dutch is thus now available in German and English translations, a testimonial to its basic and timely content. Subject matter deals with amplification, frequency changing, parasitic effects, distortion and detection.

Elektrische Maschinen. **By Rudolf Richter. Published by Springer-Verlag, Berlin W 35. 642 pages, illustrated. Price (bound) DMark 49.50.**

A fifth edition of the well-known treatment of single-phase and polyphase machines. It deals academically with a wide range of types from the design angle.

Fortleitung electrischer Energie loongs Leitungen in Starkstrom und Fernmeldetechnik. **By Werner zur Megede. Published by Springer-Verlag, Berlin, W 35. 162 pages, illustrated. Price DMark 13.50.**

A mathematical discussion of long distance transmission of power and signals including high frequency.

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Get man-hour savings that really cut construction and maintenance costs with these rugged Simplex Jacks. Get fast, safe jacking, with easy operation that speeds work!

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Jacks

TEMPLETON, KENLY & COMPANY
1242 S. Central Ave. Chicago 44, Illinois

TECHNICAL LITERATURE

Industrial Control—Such control equipment as pushbuttons, resistors, brakes, autotransformers, reactors, control centers and controllers are covered in *NEMA Standards for Industrial Control*. A revision service is provided for this 116-page publication, No. IC1-1949. It is obtainable for $5 from National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.

Vulcanized Fibre—*NEMA Standards for Vulcanized Fibre* (No. VUI-1949) gives information concerning the standard grades, colors, dimensions, and physical electrical and chemical properties of vulcanized fibre. The standard is available for 50¢ from National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.

Metal Cleaning—Almost 500 references and abstracts are contained in the 72-page *ASTM Metal Cleaning Bibliographical Abstracts (1893-1949)*. Four indexes are by subject, author, specification, and patent. Copies can be purchased at $2.75 from American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa.

Textile Materials—Methods of testing and tolerances of woven continuous filament and staple glass fabrics for electrical purposes are included in the 1949 edition of *Standards on Textile Materials*. Altogether, 84 specifications and related information are given on cotton, rayon and silk, wool, asbestos, and glass. Copies of this 586-page book can be obtained for $4.50 from American Society for Testing Materials, 1916, Race St, Philadelphia 3, Pa.

Street Lighting—Part One of *Planned Street Lighting for Public Safety* discusses the need for public safety lighting and contains charts, graphs, and photos for presenting this phase of the problem. Part Two contains basic information on visibility and sight distance, glare, and reflection. Last part is concerned with planning a street lighting program. Booklet B-4332 is available from Westinghouse Electric Corp, P. O. Box 2099, Pittsburgh 30, Pa.

Ferrous Metallurgy—A colorful plastic-laminated wall chart, "Basic Guide to Ferrous Metallurgy" is an iron-carbon equilibrium diagram showing working characteristics of steels at temperatures from —300 F to 2,900 F. Twenty-three fundamental metallurgical terms are explained. It may be had without charge to executives who request it on company stationery, stating their position. Tempil Corp, 132 W. 22nd St, New York 11, N. Y.

Friction Tables—*Tentative Standard on Pipe Friction* includes tables and charts prepared from latest data and arranged in convenient form. Friction loss for water is shown in tabular form for pipes ⅛ in. to 84 in. For pipes from ⅛ in. to 12 in., a series of charts shows complete range of viscous and turbulent flow. There is also a listing of losses in valves and fittings. Price of the booklet is $1.50 from Hydraulic Institute, 90 West St, New York 6, N. Y.

Insulating Varnish—*Practical Factors in Applying Insulating Varnishes* treats understanding of basic chemistry, air drying, evaluation of test methods, reproducing use conditions in tests, newer developments, and testing methods. Four tables and a checklist of selection application factors are given. The booklet, priced at 25¢, may be obtained from V. W. Palen, Bureau of Public Information, New York University College of Engineering, New York 53, N. Y.

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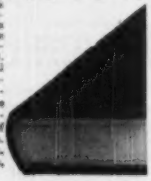

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Turbines and Governors—Definitions contained in *Standards for Hydraulic Turbines and Governors (Definitions and Nomenclature)* were compiled to furnish a common language for use in developing future standards. Typical drawings and schematic diagrams are included to illustrate the nomenclature and definitions. There are 28 pages in Publication HT1-1949, and it is priced at $1.40 from National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.

Electrical Contacts—Fundamental notes for contact design covering six pages, and a discussion of contact materials, properties and advantages are given in a 36-page booklet, *Electrical Contact Engineering Information*. There is also an illustrated discussion of practical assembly methods, including riveting, spinning, upsetting, welding, and brazing. Copies are obtainable without charge from Fansteel Metallurgical Corp., North Chicago, Ill.

Vulcanized Fibre—*Standards for Vulcanized Fibre* gives information concerning the standard grades, colors, dimensions, and physical, electrical, and chemical properties of vulcanized fibre. Publication VUI-1949, 12 pages, may be had for 50¢ from National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.

Radioisotopes—A general survey of tracer and control work being done with radioisotopes, entitled *Radioisotopes . . . A Survey*, is directed primarily at the industrial reader. Principles of the tracer method and uses of tracers are presented. The booklet is available from The Kellex Corp, 233 Broadway, New York, N. Y.

Dissolved Oxygen—*Method and Procedure for the Determination of Dissolved Oxygen in Deaerated and/or Partially Deaerated Waters* is a 32-page booklet which includes information on accuracy, precision and interpretation of the tests described. The standards can be procured, for $2, from Heat Exchange Institute, 90 West St, New York 6, N. Y.

Switchgear—Practical information concerning construction, test, performance, and manufacture of switchgear appears in *Standards for Power Switchgear Assemblies*. Included in these standards are switches, interrupting devices, and control, metering, protective and regulating equipment with associated interconnections and supporting structures. Publication SG5-1949 costs $4, and is issued by National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.

Aluminum Extrusions—Basic engineering principles that will enable the designer to use extruded aluminum shapes most effectively are explained and illustrated in a 128-page book, *Designing with Aluminum Extrusions*. Copies are furnished when request is made on company letterhead. Reynolds Metal Co, 2500 S. Third St, Louisville, Ky.

Marine Propulsion—*Standards for Marine-Propulsion Steam Turbines and Gears* also contains information on ratings, speeds, "K" factors, allowable pressure and temperature variations, standard accessories, etc. It is publication MP4-1950, available for $1 from National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.

Isotopes—"Chart of the Nuclides" is a new edition, prepared in Knolls Atomic Power Laboratory, of the "Chart of the Isotopes" originally prepared in 1948. Use of the chart is presented in an accompanying booklet, "Nuclides and Isotopes", along with some general explanatory material. Chart and booklet are available free of charge from Manager, General News Bureau, General Electric Co, Schenectady 5, N. Y.

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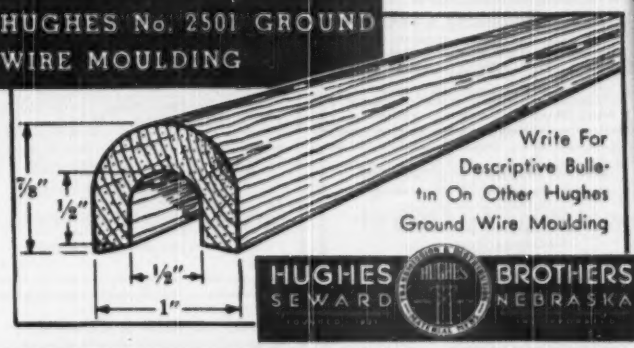

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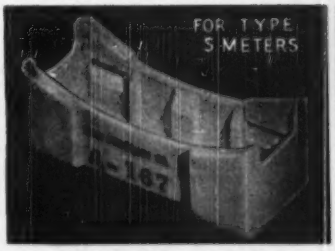

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LETTERS TO THE EDITOR

Replacement Economics

To the Editor of ELECTRICAL WORLD:

A number of papers dealing with the economics of plant replacement have appeared in the technical press which exhibit faults. One such paper, "An Economic Formula for Watthour-Meter Retirement," by Chapman and Carvill appeared in ELECTRICAL WORLD for Nov. 19, 1949; another, "Old Watthour Meters a Drag on Economy" by F. E. Davis was published in *Electric Light and Power* for Dec., 1949. Both provide examples of confused reasoning and errors of omission which, it seems to me, detract seriously from the value of otherwise first-rate articles.

For example, in the Chapman-Carvill paper it was indicated that an additional dollar spent for maintenance, or lost through under-registration, results in a net cost to the utility of only 62¢, because net income is thereby reduced, resulting in an income-tax reduction of 38¢. Although this is a very common conclusion, it simply isn't true when a fixed rate of return has been assumed, as it was in that case.

With a fixed rate of return and a stipulated tax rate, the replacement affects income taxes only if there is a change in the capital investment. If first cost of the new meter exceeds that of the old, revenue dollars must increase, and income taxes will increase accordingly. The proposed formula does not provide for this.

As for errors of omission, the authors recognize the effect of dispersion of retirements in estimating life expectancy, but neglect its effect on their compound-interest computation (the equivalent of depreciation expense), although for an average life of 40 years and the types of dispersion they mention, the result is very nearly to double their allowance.

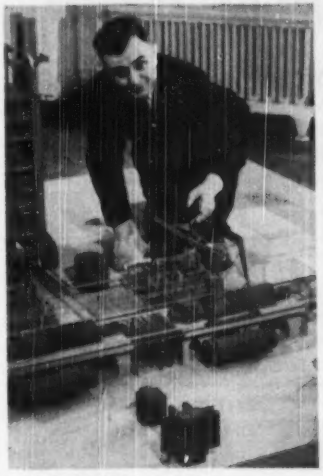
For simplicity, the formula omitted any allowance for removal costs or salvage value; it also ignored taxes on gross receipts. These items may not be substantial with respect to meters, but they are sometimes very important.

Not many textbooks are very helpful in such matters. . .

There seems to be a crying need for a simple outline of the right approach which explains convincingly and in engineers' language why it is correct, describes the arithmetic involved, and discusses some recurrent errors.

Paul H. Jeynes
Distribution Plant Engineer
Public Service Electric & Gas Co
Newark, New Jersey

P. E. GOURDON



R. J. SHERMAN and model

Mistaken Identity

To the Editor of ELECTRICAL WORLD:

In your February 27 issue, the cover carries a photograph of the model used on the combined plants described in the article starting on Page 82. I note that the description of the cover indicates that I am demonstrating the model. This model is actually being demonstrated by Mr. R. J. Sherman, my Project Engineer on this group project.

P. E. Gourdon
Chief Mechanical Engineer
Ebasco Services Inc
New York City

(Editor's Note: To correct this case of mistaken identity, and to put the record straight, ELECTRICAL WORLD publishes, above, correctly labeled pictures of Mr. Gourdon and Mr. Sherman.)

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ADDITIONAL EMPLOYMENT ADVERTISING ON PAGE 160

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UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Specifications No. 2982) will be received by Bureau of Reclamation, Denver, Colorado, May 23, 1950, and then publicly opened for furnishing main and auxiliary control equipment, miscellaneous unmounted equipment, and carrier-current telemetering equipment for unts A-3, A-4, and A-9, Hoover Power Plant and for Parker Power Plant, Phoenix substation and Phoenix dispatcher's office, Boulder Canyon Project, Arizona-California-Nevada, and Davis Dam Project, Arizona-Nevada. Delivery is desired within 330 days. For particulars, address Bureau of Reclamation, Building 1-A, Denver Federal Center, Denver, Colorado.

MICHAEL W. STRAUS, Commissioner. (100)

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Specifications No. 2991) will be received by Bureau of Reclamation, Denver, Colorado, May 25, 1950, and then publicly opened for furnishing two 115-kv, 1,200-amp, 5,000,000-kva, outdoor power circuit breakers, with an interrupting time rating of 3 or 5 cycles for Tracy switchyard, Central Valley Project, California. Delivery is desired within 360 days. For particulars, address Bureau of Reclamation, Building 1-A, Denver Federal Center, Denver, Colorado.

MICHAEL W. STRAUS, Commissioner. (101)

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1000	G.E.	600	275	4150
1000	Whse.	900	600	4150

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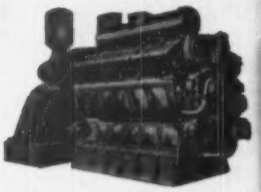

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KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1875	Fairbanks Morse	32P16	2000	300	375	Enterprise	DeO-6	450	450
1420	Fairbanks Morse	36D8⅛	1600	720	330	Superior	KNA	396	514
1250	General Motors	16-278A	1600	720	312	General Motors	8-268A	450	1200
937.5	General Motors	12-567	1080	720	312	Clark	MD-4	375	267
625	Alco	6-12½x13T	750	600	187	Ingersoll Rand	8	225	514
425	Baldwin	VO-6	510	450	125	General Motors	3-268A	150	1200
400	Buckeye	80	480	600	75	General Motors	6043C	90	1200

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Advertising In This Issue

Allen-Bradley Co. 19, 20
Allis-Chalmers Mfg. Co. 7, 28, 29, 56, 57
Anaconda Wire & Cable Co. 122, 123
Appleton Electric Co. 40

Babcock & Wilcox Co. 46, 47
Bartlett Tree Experts 148
Bauer & Black Div. of Kendall Co. 136
Bell Telephone Laboratories 44
Bendix Aviation Corp., Friez Instrument Div. 151
Blackhawk Mfg. Co. 155
Blaw-Knox Co. 59
Brewer-Titchener Corp. 55

Chance Co., A. B. 142
Chase Brass & Copper Co. 66
Collin Street Bakery 157
Copperweld Steel Co 51
Crouse-Hinds Co 10, 11

Delta-Star Electric Co. ..... Third Cover
Directory of Engineers 158
Dow Chemical Co. 137

Ebasco Services, Inc. 42
Ebasco Engineering Co., Inc. 153
Electric Controller & Mfg. Co., The 43
Electric Service Mfg. Co 26
Electric Storage Battery Co., The 25
Electrical Engineers Equipment Co 63
Elliot Co 60, 61
Engineers, Directory of 158
Everstick Anchor Co. 128

Federal Electric Products Co. 58
Foster Wheeler Corp. 30, 31
Four Wheel Drive Auto Co. 64

G & W Electric Specialty Co. 150
General Electric Co. Apparatus Dept. 105, 107, 108, 109, 111
Construction Materials Dept. 112
General Radio Co. 53
Graybar Electric Co. 5
Gulf Oil Corp. 135

Haley & Co., Inc., R. G. 144
Harper Co., The H. M. 121

Hazard Insulated Wire Works 4, 154
Hoskins Mfg. Co. 18
Hotpoint, Inc. 132, 133
Hubbard & Co. 139
Hughes Bros. 157

Indiana Steel & Wire Co. 156
International Nickel Co., Inc., The 54
Irvington Varnish & Insulator Co. 14
I-T-E Circuit Breaker Co. 22, 23

Kearney Corp., James R. 125, 126, 127
Kerrigan Iron Works, Inc. 150
Kidde & Co., Inc., Walter 62
Kuhlman Electric Co. 12, 13

Lapp Insulator Co., Inc. 48
Leader Electric Co. 67
Line Material Co. 33, 34, 35, 36, 37, 38, 39

McGraw-Hill Book Co., Inc. 156
McGraw-Hill Pre-Filed Electrical Catalogs 150
Memco Eng. & Mfg. Co., Inc. 155
Minnesota Mining & Mfg. Co. 124
Moloney Electric Co. 117
Murray Mfg. Corp. ..... Second Cover

National Electric Products Corp. 68
National Telephone Supply Co., The 6
National Varnished Products Corp., The 24

Ohio Brass Co. 119
Okonite Co., The 4, 154

Page Fence Assoc. 155
Pennsylvania Transformer Co. 45
Penn-Union Electric Corp. 41
Pioneer Service & Engineering Co. 157
Prat-Daniel Corp. 50

Railway & Industrial Engineering Co. 15
Revere Copper & Brass, Inc. 114, 115
Rockbestos Products Corp. 130
Ryerson & Son, Inc., Joseph T. 146

Sangamo Electric Co. 8, 9
Searchlight Section 159, 160, 161
Sherman Mfg. Co., H. B. 154
Simplex Wire & Cable Co. 27
Spang-Chalfant Div. of National Supply Co. 32
Square D Co. 65
Standard Oil Co. (Indiana) ..... Fourth Cover
Star Porcelain Co. 157
Stone & Webster Engineering Corp. 129

Templeton, Kenly & Co. 156

Uptegraff Mfg Co., R. E. 21

Victor Insulators, Inc. 149

Wagner Electric Corp. 52, 145
Westinghouse Electric Corp. 16, 17, 141, 143
Westinghouse Electric Corp. Lamp Dept. 40

■

PROFESSIONAL SERVICES 158

■

SEARCHLIGHT SECTION
(Classified Advertising)

EMPLOYMENT
Positions Vacant 159, 160
Selling Opportunities Offered 160
Positions Wanted 160
Selling Opportunity Wanted 160
Employment Service 160

BUSINESS OPPORTUNITIES
Offered 160
Wanted 160

NOTICES
Legal 160

EQUIPMENT
(Used or Surplus New)
For Sale 161

WANTED
Equipment 160

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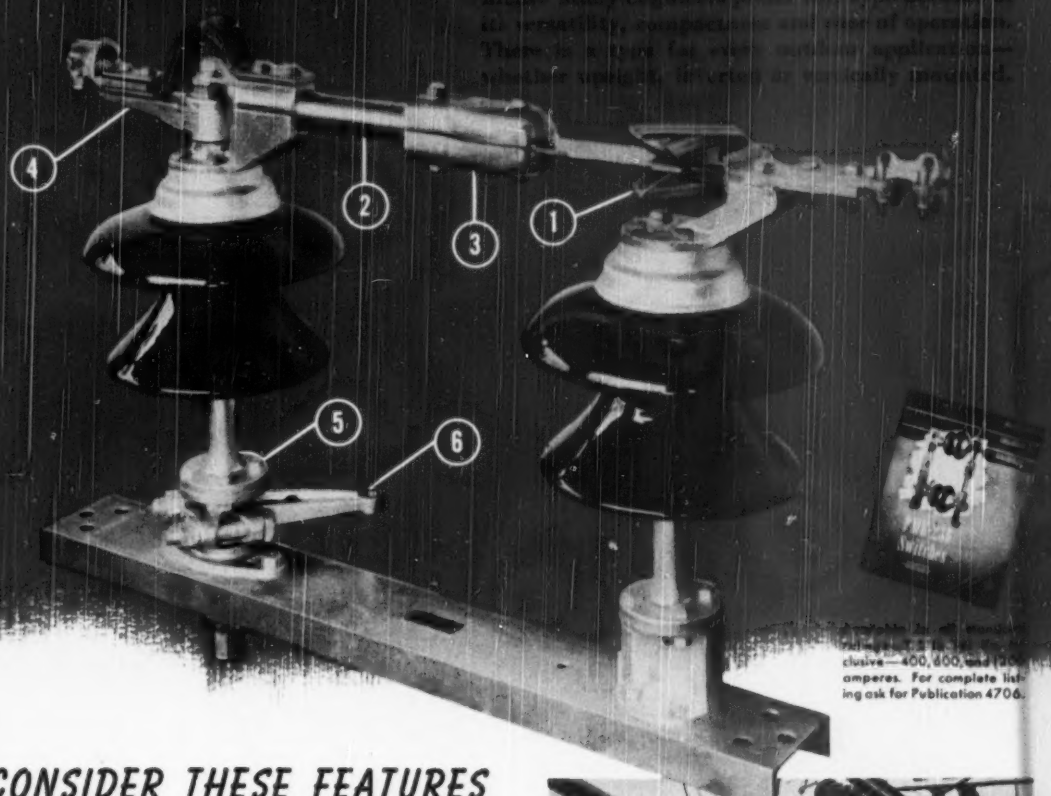

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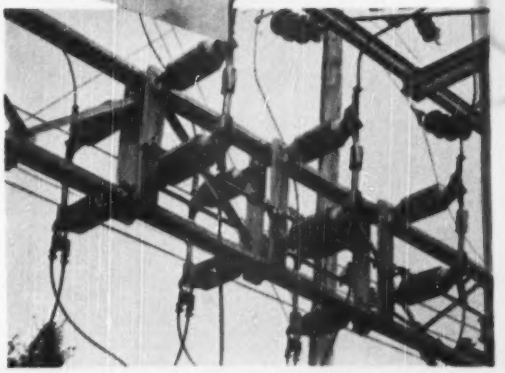

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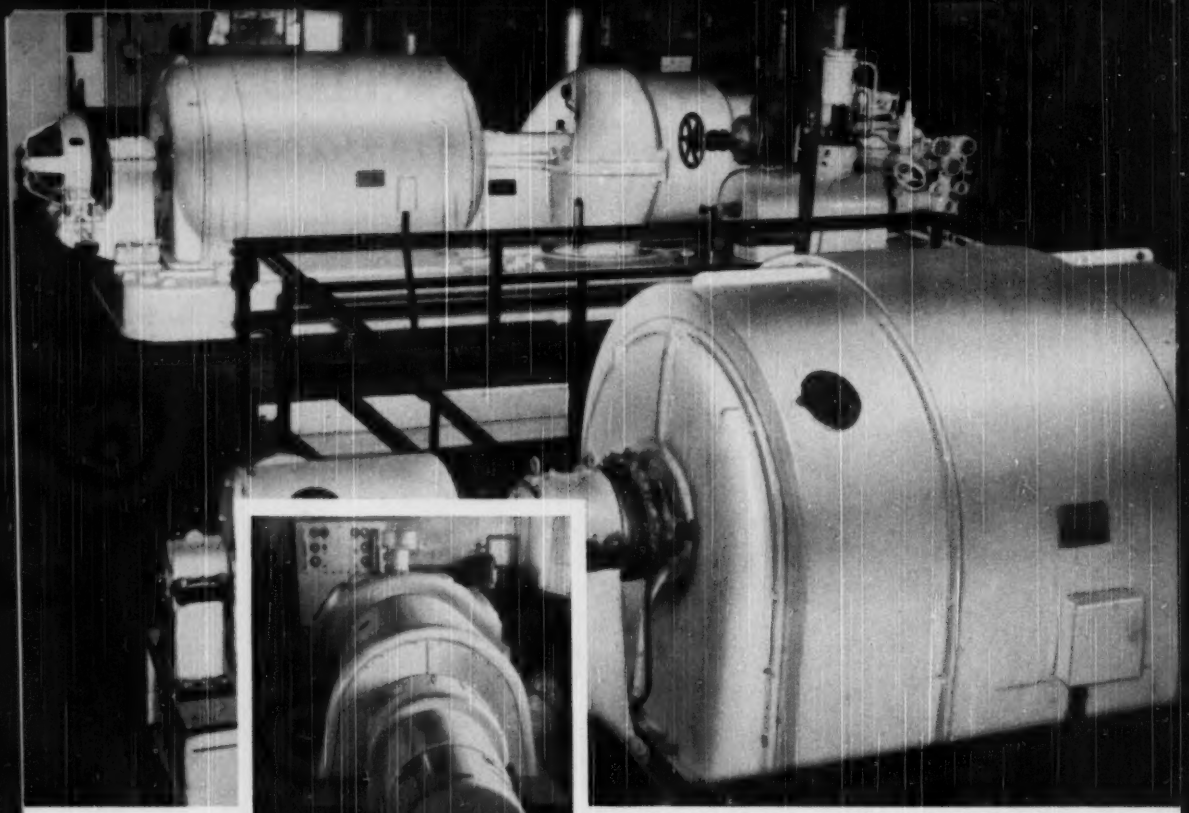

Above: Two Allis-Chalmers turbines of 1500 KW and 1250 KW in the municipal light and power plant, Atlantic, Iowa. They have been operated for 11 and 21 years, respectively, on NONPAREIL Turbine Oil without oil changes.

Left: New 3500-KW General Electric turbine in this plant replaced 21-year old unit from which NONPAREIL was taken and used further as make-up oil.

21 years without oil changes

IN 1929, two Allis-Chalmers turbines of 750 KW and 1250 KW were put into operation at the municipal light and power plant at Atlantic, Iowa. In 1939, a 1500-KW unit of the same make was added. All of these turbines were filled with NONPAREIL Turbine Oil.

In the 11 to 21 years of operation on NONPAREIL, there have been no oil changes, no treating of the oil for acidity, no filtering of the oil except for passing it through a metal strainer. Neutralization numbers have stayed below 0.09 mg. KOH/gm.

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